THE RHODESIA

# Agricultural Journal.

Issued by Authority of
the Minister of Agriculture and Lands.

VOL. XXVI.—No. 2.] FEBRUARY, 1929. [5s. per annum.

## Leading Features.



PUBLISHED MONTHLY.

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Mr. Amery offering a Rhodesian cigarette to Lord Cushendun, the Parliamentary Under Secretary of State for Foreign Affairs, at the Anglo-Rhodesian Tobacco Company's newly opened shop in Queen Victoria Street, London.

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# Agricultural Journal.

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*Editor* *William E. Meade.*

VOL. XXVI] JANUARY, 1929. [No. 1

## Editorial.

*Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:— The Editor, Department of Agriculture, Salisbury.*

**The New Year.**—By the time this Journal is in the hands of our readers a new year will have dawned, bringing with it hopes and aspirations for the future. We tender seasonal greetings to all our readers, and trust that the year 1929 will be one of bumper crops and profitable enterprise. A good start has been made with copious and general rains, but, unfortunately, early promise is not always fulfilled in Rhodesia. We can only hope that we shall be spared the long dry spell which did much damage to the crops last year, and that farmers will recoup themselves for the losses then sustained.

The passing of 1928 will not be the cause of many regrets from a farming point of view. It will always be associated with the tobacco slump which has caused a great deal of distress among new settlers, and has for the time being

retarded the tide of immigration. That its effects are but temporary we are convinced, and it may be that the result will be beneficial eventually. If it teaches the lesson of not relying on one crop it will have served a good purpose. In any country, but particularly in Rhodesia, one crop farming is a hazardous proceeding and can only lead to disaster. There has undoubtedly been too much of the "get rich quick" atmosphere about tobacco growing, and it is necessary to call a halt. We are convinced that tobacco growing in this Colony is capable of considerable expansion, but it must be removed from the sphere of speculative enterprise.

Taking everything into consideration, we feel that Rhodesian agriculture is making steady progress. It is too much to expect that during the brief spell of European occupation all the difficulties associated with pioneer farming can be overcome. There are many problems still to be solved, many obstacles to be overcome, but the industry has been laid on sound foundations, and the spirit which has brought us through the many difficulties of the past will carry us further along the path of progress. Reflecting for a moment on the position of the industry to-day, we see that we can grow maize of a quality equal to any in the world, our tobacco is recognised to be as good as average Virginia leaf of America, our cattle are improving and are saleable on the English market, our citrus fruit industry is making rapid progress, the prospects of sheep farming in certain parts of the Colony appear to be promising, and cotton, dairying and the growing of oil seeds are of great promise. The possibilities of timber growing are hardly realised as yet, while the poultry industry is progressing very favourably. Our difficulties are mainly those of marketing. This requires the concentrated attention of the best brains of the Colony, and we trust that the coming year will mark a united effort to solve the problem.

Again we wish all our readers a prosperous New Year.

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**Botany and Mycological Laboratory.**—The illustrations reproduced on the opposite page are of the botany and mycological laboratory which has recently been completed at the Agricultural Experiment Station, Salisbury. The building

Interior view

New botany and mycological laboratory at Salisbury.

consists of a botany herbarium and library, mycological laboratory, sterilising room, store room, office and typist's room. The rooms are airy and bright, and are lighted with electricity, which is also employed for heating in the laboratory. The building is well equipped with the necessary instruments and apparatus, and botanical and mycological work can proceed under propitious conditions. The Botany and Mycological Branches of the Department of Agriculture have now been merged into one, with Mr. J. C. Hopkins in charge. His staff consists of a botanist who graduated at Cambridge University and a temporary assistant in mycology.

The erection of this laboratory is another instance of the desire of the Government to foster and encourage the agricultural industry in every way possible.

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**A Good Record.**—Attention is drawn from time to time in this Journal to records put up by Rhodesian milk cows. No better record for a heifer with her first calf has been sent in than that of "Bluffhill Flora," a young cow belonging to Mr. W. R. Waller, Bluffhill, Salisbury. The heifer calved at 2 years 3 months old, and in her first lactation of 300 days has produced 10,579 lbs. of milk, with a total butter fat production of 351.64 lbs. During the first 150 days of her lactation she never produced less than four gallons of milk per day, and never throughout her lactation had a test of less than 3 per cent. butter fat. She is due to calve on 13th February, 1929.

This record is outstanding for a Rhodesian cow, but, given good treatment and well-bred cattle, there is no reason why the 1,000 gallon cow should be as scarce as it is to-day. It is stressed that no animal can produce milk in quantity without suitable feed. All the feed that was fed to "Bluffhill Flora" was produced in the Colony, and most was produced on the farm itself. The only food purchased was ground nut cake, and, if farmers wish to do so, they can always send in their ground nuts to the oil factories and obtain cake in exchange.

**Elephants in Belgian Congo.**—Mr. E. Dejong, Director of the Bambeza Cotton Station, makes a brief reference in *Agriculture et Elevage au Congo Belge* (No. 18) to ploughing trials carried out with elephants and tractors working under similar conditions. It was found that elephants are much better and much cheaper for this type of work than tractors. They are not, like tractors, hampered by the wetness of the soil during the rainy season, when most of the ploughing is done, and are said to overcome such obstacles as white ants' nests and boulders with the greatest of ease. Where there are particularly heavy obstacles in the way, elephants will stop instinctively, and in this respect are much superior to a tractor, which, under the control of a native, may do serious damage by forcing tackle over such obstacles. Elephants work faster and are easier to keep and to control. Finally, Mr. E. Dejong gives some interesting figures as to the comparative costs of maintaining a team of two elephants and a tractor for one year. By supposing that one tractor and a team of two elephants will each plough 100 hectares* per year where petrol costs 7 francs† per litre, he works out the cost per hectare as follows:—

ONE TRACTOR.

| | Fr. |
|---|---|
| Petrol | 350 |
| Oil | 126 |
| Mechanic | 18 |
| Depreciation | 108 |
| Repairs | 21 |
| Total ... | Fr. 623 |

TWO ELEPHANTS.

| | Fr. |
|---|---|
| Food | 1 |
| Labour | 36 |
| Depreciation | 20 |
| Veterinary attendance | 2 |
| Total ... | Fr. 59 |

* Hectare = approximately 2½ acres..
† Belgian franc = 6.857 pence.

From these figures it is contended that by using a team of elephants 564 francs can be saved per hectare, or 56,400 francs per year. The cost of the elephants' food, however, appears to be exceptionally low, and it would be interesting to have additional details on this item.

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**Turretfield Demonstration Farm.**—We have previously referred in this Journal to the results obtained at the Turretfield Demonstration Farm in South Australia, which was handed over to the Director of Agricuture to be run as a demonstration farm, i.e., a farm on which the endeavour was to be made to demonstrate financially the principles on which farming should be carried out in that particular district. The total available farm area is 1,533 acres, of which 1,266 acres are arable land, 252 acres non-arable land, while 15 acres contain buildings, yards, plantations, etc. The farm, fully equipped, was capitalised at £17,590 18s. 2d., and interest charged at the rate of 5 per cent. per annum. Every item of expenditure is charged against the farm, including the salary of the manager, who is paid £300 per annum. Working capital was provided by the Government, and interest charged thereon at the rate of 6 per cent. per annum. The original scheme of farm operations implied a farm worked on a three course rotation, namely, (1) bare fallow, (2) wheat or cereal hay, (3) secondary cereal, in association with a flock of sheep and a herd of swine. In the course of time, however, circumstances, chiefly of an economic nature, necessitated material alterations to this scheme. For instance, pigs were abandoned as being too uncertain in their return in the absence of a regular overseas outlet for surplus production, while hay growing for market purposes was displaced from its position of main farm crop.

From a report of the operations to date, it is shown that after meeting all expenses and paying interest on capital, the accumulated net profits of six and three-quarter years' operations amount to £2,748 18s. 3d., representing a mean net profit per annum of £407 4s. 11d. The farm has cost the State nothing, while the State Treasury has received from the farm the sum of £6,953 6s. 11d. The interest earned over the period of six and three-quarter years is 6.69 per cent. per

annum. Over a period of six successive seasons the mean yearly value of the gross farm output from 1,533 acres of land, 17 to 18 per cent. non-arable, has been represented by £5,030 17s. 11d., or 65.8 per cent. per acre on the whole area. Towards this total crops have contributed £2,841 12s. 7d., or 56.4 per cent.; live stock £1,671 12s. 7d., or 33.2 per cent.; and miscellaneous £577 11s. 9d., or 10.4 per cent.

The average rainfall at Turretfield for the past 19 years is 18.32 inches.

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**Fattening for Beef.**—We have previously drawn attention in this Journal to the growing practice in this Colony of fattening cattle for the butcher. The parts most favoured at the present time are the grain areas of Mashonaland, where the necessary foodstuffs are readily available. It is a practice which has definitely been proved by a number of farmers to be a profitable undertaking providing suitable beasts are fed and the right methods are adopted, though up to the present actual costs of the process have not been available. We are now able to produce complete data of the cost of fattening cattle for slaughter at the Gwebi farm, from which a very clear idea can be obtained as to the financial results achieved. The figures we publish elsewhere in this issue of the Journal show that the average profit made on the 65 head of cattle fed this year amounted to £3 10s. 7d. per head, without allowing for the value of the manure, of which 130 tons were accumulated. This figure does not allow for the profit on the foodstuffs supplied at standard values. The figures, however, suffice to show that the fattening of these cattle at Gwebi proved a profitable undertaking, and we have no doubt that, if the necessary data were available, similar results would be recorded by other farmers. Before passing from this reference to the Gwebi farm we would remark that this is the first detailed report which has been issued of the actual cost of farming operations at the farm since it has been worked as a commercial proposition. Careful costings of all operations are now being kept, and a special officer trained in such work is stationed at Gwebi to maintain the necessary records.

From figures kindly supplied to us by the Veterinary Department we see that 1,076 head of cattle were fattened for the Johannesburg market this year on farms in the vicinity of Salisbury. In addition to this, 64 oxen were exported to England in July per s.s. Knowsley Hall, and there were possibly others sold and consumed locally. The splendid exhibits of fat stock at the Salisbury Show indicate that farmers are able to meet the butchers' requirements, and the excellent prices realised on that occasion will no doubbt act as an incentive to further effort. From July to November appears to be the optimum period for the Johannesburg market, while in order to realise the best prices in England it is essential that the cattle should arrive in May, June or July. We understand that Mr. J. R. Stewart, of Shangani, is endeavouring to get together another shipment for next year, and we hope that his efforts will be successful.

The only limiting factor to an extension of the practice of fattening cattle is the difficulty in obtaining suitable steers, but we have no doubt that, as the demand increases, so will the necessary animals be forthcoming. In the meantime, we consider that present developments mark a distinct advance in the agricultural practice of this Colony, and bring within measurable distance the time when a large proportion of our crops will be marketed in this form.

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**Agricultural Statistics.**—We have received a copy of the Report on the Summer Crop Returns for the season 1926-27 and the Winter Crop and Live Stock Returns for 1927, compiled by the Government Statistician. We have already published the preliminary returns in this Journal, but the report now issued gives a considerable amount of detailed information which was not available at that time. The completed figures show that the total area under crops in 1926-27 was 346,776 acres, of which 267,354 acres were planted to maize, 30,164 acres to tobacco, 8,134 acres to cotton, and 7,813 acres to ground nuts. Some comparisons are given of the yields per acre with other countries, showing that Southern Rhodesia occupies a somewhat lowly position in this respect. The maize crop totalled 1,659,597 bags, of which 46 per cent. were grown in the

Mazoe district. The yield per acre over the whole of the Colony was 6.20 bags. In the Mazoe district the yield was 8.9 bags per acre. The total number of growers of maize was 2,039, representing an increase of 10 per cent. over the previous year. Growers of 301 acres and over numbered 222, while there were 145 growers of 201-300 acres, 308 of 101-200 acres, and 1,369 of 100 acres and under.

The Virginia tobacco crop in 1926-27 amounted to 18,631,000 lbs., representing an increase of 13,317,878 lbs. over the crop of the previous season. The number of growers was 763, and the average yield per acre was 639 lbs. Turkish tobacco yielded 633,468 lbs., an average of 638 lbs. per acre.

The cotton crop amounted to 734,786 lbs. of seed cotton, an average of 90 lbs. per acre. The jassid was the main cause of the low yield.

The yield of ground nuts was 65,934 bags, or an average of 8.4 bags per acre.

The production of winter wheat in 1927 amounted to 9,673 bags, or 2.9 bags per acre; of oats, 1,060 bags; and of barley, 2,126 bags.

The total number of bearing citrus trees in the Colony in the year 1926-27 was 158,473 and of bearing deciduous fruit trees 60,061. Of non-bearing citrus trees there were 46,207, and of deciduous 25,611.

The total number of cattle owned by Europeans on 31st December, 1927, was 954,835, representing a decrease of 36,381 as compared with the total of the previous year. The estimated number of cattle owned by natives was 1,370,567, making a total for the Colony of 2,325,402 head. The local consumption for the year was 91,083 head, of which 79,695 were slaughtered by butchers and 11,388 by farmers. The total number of deaths reported in 1927, including 4,512 animals lost or stolen, was 57,715, or a death rate of 6 per cent. The number of cattle exported is shown as 60,543 in 1925, 74,821 in 1926, and 46,898 in 1927.

The number of Europeans employed on farms in 1926-27 is given as 5,816, of whom 1,559 were females. The total number of natives employed on farms was 83,935 compared with 74,750 in 1926.

**Soil Erosion.**—In a newspaper report of a lecture delivered by the Acting Irrigation Engineer to a meeting of farmers on the subject of soil erosion it is stated that the lecturer opened his address by administering a rebuke to local farmers for not carrying out his exhortations in a previous address. We do not think that what was said on that occasion was in the nature of a rebuke, but rather an expression of keen disappointment at the neglect to carry out measures of great urgency. The Acting Irrigation Engineer is not alone in his experience. We could point to a great number of instances where advice has fallen on deaf ears, and where the preachings of the Department have failed in their object. We know of an instance—and there are probably others—where a farmer lost a good sum of money by planting a crop too deeply. He had at hand the *Agricultural Journal*, wherein were given full instructions on the point: he had not even opened it. Officials are frequently asked for advice on subjects which have been fully dealt with in the Journal.

It is the duty of the officials of the Department to endeavour to get farmers to apply modern principles of agricultural practice to their farming operations. It is the endeavour of the Department of Agriculture to uplift the agricultural industry, and it is for this purpose that large sums of public funds are voted annually. It is, however, impossible to achieve any measure of success unless the farmer himself will pay heed to the advice given. We do not wish to indulge in a lecture to farmers, but we do think that a little straight talking is called for. At the meeting to which we have referred a list was opened for those who are desirous of starting anti-erosion works in the next dry season, and we are pleased to see that eight names were handed in. They will receive all the assistance possible from the Department of Agriculture, and we trust that their numbers will be augmented.

It is very much regretted that owing to pressure of work the continuation of the article on soil erosion is not yet available for publication. It is hoped, however, to publish a further instalment in the February issue, and to reproduce with it diagrams of works intended to prevent erosion. Every endeavour is being made to bring to the notice of the farming community the seriousness of the menace. Signs are not

wanting that in certain parts of the Colony the evil is getting the upper hand, and immediate action is called for. We trust that during this wet season close watch will be kept on danger points, and plans made for protective measures when conditions permit.

The measures advocated by the Irrigation Department to mitigate the dangers of soil erosion may be summarised as follows: (1) encourage the growth of vegetation on uncultivated lands; (2) graze or cut the grass, do not burn it; (3) do not overstock the grazing areas, but initiate a system of paddocking; (4) protect all roads with drains of sufficient capacity to carry off storm water; (5) wherever possible, block gullies and washouts with brushwood or boulders enclosed in pig netting, leaving a space for the discharge of storm water over the stops; (6) protect all cultivated lands with storm drains, and on lands with a slope greater than 1 in 40 construct a system of contour ridges.

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**Cattle in the United States of America.**—We have received from the United States Department of Agriculture *The Livestock Review for* 1927, which contains a great deal of interesting data relative to the cattle position in that country. It is stated that the change in the cattle situation during 1927 in so far as beef cattle are concerned was phenomenal. The situation has apparently been developing for years, and although the decreased market supply of range cattle became apparent during the last half of 1926, it was not until the last half of 1927 that the pending shortage of all cattle was actually realised. Prices advanced all during the year, and fed cattle came to market lighter and younger than usual.

The magnitude of the cattle trade in the United States will be realised from the fact that 9,520,124 head were slaughtered under Federal inspection during 1927. This was 6 per cent. less than the number slaughtered in 1926; the decrease amounting to 3 per cent. for the first half of the year and 10 per cent. for the last half. As stated, prices advanced almost continuously throughout the year, top prices at Chicago reaching 19 dollars per 100 lbs. in November.

Cattle numbers in the United States continued to decrease during 1927. The estimated number on farms on 1st January, 1928, was 55,696,000 head, which was 1,176,000 head, or 2 per cent., smaller than on 1st January, 1927. This was the smallest number of cattle on farms since 1912, and probably the second smallest since 1898.

From what is written, it seems probable that the industry is now at the low point of the present production cycle, and it is shown that prevailing conditions are similar in many respects to those existing at the beginning of 1913. It is expected, therefore, that from now on the trend of production will be gradually upward for several years to come. Present relatively small numbers of cattle in the country, together with the relatively higher prices which have prevailed for several months past, are expected to provide a strong incentive for cattle men to restock farms and ranges and increase their herds.

As we indicated in a recent issue of this Journal, the supplies of Canadian cattle to the British market have been diverted to the United States. Imports of Canadian cattle to the United States from January to November, 1927, amounted to 181,000, compared with 81,000 a year earlier. Imports of calves from Canada during the same period amounted to 75,000, compared with 61,000 in 1926, and imports of beef increased from 15,000,000 lbs. in 1926 to 45,274,000 lbs. in 1927.

The position is summed up as follows: "From the long-time viewpoint the cattle situation appears favourable. Since any increase in cattle numbers will not materially increase market supplies until late in 1930 or 1931, cattle prices are expected to remain on a fairly high level during the next three or four years."

According to the estimates made by the United States Department of Agriculture there were about 33,000,000 dairy cattle of all breeds in the United States on 1st January, 1927. Three per cent. of these cattle, or about 1,000,000, are pure-bred, and represent six breeds, namely, Ayrshire, Brown Swiss, Dutch Belted, Guernsey, Holstein-Friesian and Jersey. The most popular breeds are the Holstein-Friesian, which constitutes 47.4 per cent. of the total, and Jersey, representing 40.9 per cent. of the total.

The official records of 28,283 Holstein cows and heifers in the United States show an average yearly production of 15,759 lbs. of milk and 533.66 lbs. of butter fat, the average being 3.39 per cent. The ten highest butter fat and milk producers among the Holsteins range from 1,158.95 lbs. to 1,349.31 lbs. of butter fat, and from 34,071 lbs. to 37,381 lbs. of milk.

# Dairying in Rhodesia.

*Queensland is the only country in the world in which dairying is carried on successfully and on a large scale within the tropics.*

*Queensland has led all the other States of Australia in the matter of organised marketing of dairy products. She produces one-fourth of the total Commonwealth production of butter, and almost one-half of the Commonwealth cheese production.*

*Queensland's dairy industry is nearly 100 per cent. co-operatively organised. Ninety-eight per cent. of the butter and 96 per cent. of the cheese produced in Queensland are manufactured by co-operative factories under farmer control. No other country in the world, not even Denmark, can show such a great record in farmers' co-operation practically applied.*

# WHAT IS RHODESIA DOING?

The above headlines, printed in italics, are selected from an article in the October number of the "Queensland Agricultural Journal," which I suggest should be republished in this number of the "Rhodesia Agricultural Journal."

Shortly after taking office, the Editor of our Journal suggested that I should write for the following number a message of encouragement and advice to the farmers of Southern Rhodesia.

I did not accept his suggestion. I felt that it would be presumption for the new Minister, immediately on taking office, to offer advice. If there is anything in Solomon's dictum that "in multitudes of counsellors there is safety," then rather should the Minister look to the body of the farmers for counsel and advice. Words of encouragement, on the other hand, might be well intentioned, but knowing well the real difficulties that hundreds of our farmers are up against, the role of a wordy Job's comforter had no attractions.

It is mutual assistance, consideration and confidence between the farmers and the Government that really matters. The following article points to one of the many avenues through which these virtues can be brought into play.

I have asked the Editor, if possible, to publish the article in full, being careful not to omit the references to the control and compulsory marketing legislation.

This Government, for sound and well-considered reasons I think, has not adopted the principles of control and compulsory marketing, but that is no reason why the actual application of these principles should not be carefully studied.

Each of the agricultural industries can only be considered on its merits. The Government is prepared to help the dairy industry to help itself, but the industry must first struggle to its feet, it must show some life, some signs that it has not been stillborn. The opportunity is at hand.

The dairy producers of this Colony, with the example of tropical Queensland before them, are at the present moment being appealed to to pledge themselves to combine for the development and protection of their mutual interests. It is the first, and perhaps the most difficult, step—the expression of the will to co-operate.

Should this appeal be successful, I believe that the road to ultimate success will be open, and I venture to assure the producers that, within the widest limits of its legitimate province, it will be found that the Government will not fail them.

R. A. FLETCHER,

Minister of Agriculture and Lands.

The dairying industry in Queensland is conducted on strictly co-operative lines. The shareholders in a Co-operative Dairy Company Association are suppliers of milk or cream to factories, and through their elective board control their company's undertakings.

The managerial objective is to profitably manufacture the highest quality product and so market it that the producer will receive the highest possible return for his milk or cream on a quantity and quality basis. The payment of dividends on shares held by suppliers is restricted to an interest charge of 5 per cent.; no profits are distributed to shareholders in the form of dividends.

The capital invested in dairy factories totals approximately £35,000,000, while individual factories representing a capital value of from £30,000 to £60,000 are operating in the old-established dairy districts. Most of the butter factories are constructed of concrete or brick, and are modern in design and equipment.

The provisions of the Dairy Produce Act of 1920 safeguard and promote all interests in the industry. Inspectors see to the maintenance of high standards of hygiene; and processes of manufacture are carried out by operatives who have, by examination in theory and practice, proved their efficiency and hold certificates of proficiency. All dairy products are graded by qualified graders. Payments for cream are made on a commercial butter basis, and for milk on a butter fat basis. In the interests of suppliers, a continuous audit is made of each company's books and accounts.

**Where the cow is kept and cared for, the country advances, lands grow richer, homes become better, and general comfort increases.**

The Department of Agriculture and Stock has given valuable assistance in the development of dairying within the State. In its initial stage the operation of a travelling dairy for instructional purposes did much to encourage the establishment of the industry. The work of Departmental officers in the interests of the industry includes the services of the

Agricultural Chemist, Bacteriologist, Botanist, Veterinary Surgeons, Instructors, Grading Inspectors, Dairy Inspectors, and Herd Testers.

Pool Boards functioning under the provisions of the Primary Producers' Organisation and Marketing Act have given valuable service to the industry by their support of administrative action tending to improve the quality of dairy products, and also by their association with marketing activities.

The development of butter and cheese manufacture in Queensland has been along scientific lines.

**The cow is the Mother of Prosperity on Queensland's dairy lands.**

## STOCK FOODS.

The wealth of our State is based to a very large extent on the number of our live stock, and the welfare of the stock again depends entirely on the feeding, therefore the question *how, when and what to feed* is of the greatest importance to farmer and grazier. All our live stock can be regarded as living factories producing from the feed consumed products useful to man.

### Objects of Feeding.

The body of the young animal requires a sufficient amount of food to supply the materials necessary for its growth. But even during any part of the growing stage there is a continual breaking down and wearing out of all the tissues of the body, and this loss must be made up by the nutrients contained in the food to maintain the animal in a normal healthy condition. Additional food is required to produce the energy for the carrying out of all voluntary and involuntary functions of the body. An animal working hard is using up a large amount of fat and muscle, but even an animal at rest requires food for the production of heat and other involuntary functions of its body. Summarised, the objects of feeding are as follow:—

(1) To maintain bodily heat.
(2) To repair waste tissues.
(3) To reproduce young.
(4) To form new tissues and organs.
(5) To perform muscular labour.
(6) To secrete various products.
(7) To lay up reserve stores.

## A Healthy Cow Delivers the Goods.

The healthy milch cow, properly cared for, yields milk of first quality. Deterioration, if any, occurs after the dairy farmer takes delivery. In order to produce first quality cream, attention must be given to the production and handling of the milk, and the separation, handling and delivery of the cream on the factory floor. The quality of the butter produced is dependent upon the quality of the cream, the care, attention and skill of the buttermaker. The factory manager who desires to place the factory output in the highest grade must be supplied with raw products (milk or cream) of highest quality.

**The best farming methods, the most economic crops, and a steady return on investments are found on every well-managed dairy farm.**

## Grading.

Milk or cream grading is the all-important factor in determining the quality of the output. In the grading of milk or cream, or any of its products, it is essential that the grader should have his senses trained so as to be able to fully appreciate the natural influences of odour and flavour of a first-grade dairy product, be it milk, cream, butter, or cheese. The full natural flavour of carefully-produced and well-handled milk and cream, and butter or cheese, appeals to the senses of a trained grader. The cream grader and buttermaker must keep in close touch to secure the best results of

their concerted efforts. The position of grader is one of great responsibility. He must carry out his duties expeditiously and exactingly.

### Co-operation between Farm and Factory.

The percentage of third class cream is, happily, gradually diminishing, and we look forward to the day when only a high class cream will be supplied to butter factories. To reach that position managers must have the assistance of the dairy farmers, and they must support the farmers in turn. The farmers are not dairying for any other purpose than to make a profit. The majority are always ready to improve their methods and to take advantage of facilities offering, so as to deliver cream of an A1 quality. We must take a wide view of the varied conditions associated with the production, handling and delivery of cream at factories.

The provisions of the Dairy Produce Act safeguard the production and handling of milk or cream, and, when complied with, the benefits are manifest. The delivery from farm to factory calls for attention and assistance from every one interested in the transport of milk or cream. Organisation of supplies to factories on the zone system deserves consideration by dairy factory associations. Each factory should draw its supplies from what is regarded as its own geographical area.

## MANUFACTURE OF DAIRY PRODUCTS.

All associated with the dairy industry in Queensland may be fairly commended for its progress in recent years, particularly on the manufacturing and marketing sides of the business.

Under present conditions the dairy farmers of this State, constituting with their assistants about 10 per cent. of the working population, produce, not only sufficient for our entire home needs, but also contribute the equivalent of £3,000,000 a year to our export trade.

**The good breeder combines bucket capacity with show ring type.**

That the dairy products of this State have reached a high standard of quality is evident by their continued success in open competition with the production of other countries in the world's markets.

Improvement of dairy equipment has been marked within recent years, and most of our factories are of modern construction and equipment, ensuring efficiency in operation.

It has been observed that centralised factories possessing modern manufacturing machinery, and operated under efficient management, have been an important factor in increasing the quality and value of the product.

There is evidence that the establishment of a zonal system, under which central factories would receive cream supplies from the whole of a recognised tributary territory, would eliminate expensive competition and open the way for a complete organisation of cream deliveries.

More cheese is manufactured in Queensland than in any other State of the Commonwealth, and Queensland contributes over 85 per cent. of the total cheese exports from Australia.

**The most and best milk;**
**The most and best cream;**
**The most and best butter;**
**The most and best cheese;**
**The most and best profit must come from our dairy cows.**

Gradual improvement in roads and motor transport make it possible for larger centralised cheese factories to operate economically. A higher grade and a more uniform product, and consequently a better price for milk, would result from placing factories of modern design and equipment in central situations.

The attention of many Co-operative Dairy Associations interested in the manufacture of cheese is directed to these possibilities.

## MARKETING OF DAIRY PRODUCE.

At the request of the cheese producers, compulsory marketing was provided for by State legislation under the

Cheese Pool Act of 1921, which came into operation on the 1st January, 1922. On the expiry of the term for which it was constituted under the Cheese Pool Act, the Cheese Pool Board was reconstituted under the Primary Products Pools Act of 1922 (now the Primary Producers' Organisation and Marketing Act of 1926). Under the Act a Board is elected comprised of representatives of the dairy farmers engaged in cheese production. The Minister for Agriculture has one representative on the Board. The Board has power to direct and to control the marketing of cheese, but has, however, from its inception, adopted the plan of utilisation of the existing channels of distribution. The distributors are chosen by the factories, and act as their selling agents, although under licence by the Board.

## Organised Marketing of Butter.

The marketing of butter is controlled under the Primary Producers' Organisation and Marketing Act by the Queensland Butter Board, operating under that statute, the Board having been constituted on the 19th February, 1925. The Board, which is elected by cream suppliers, does not itself undertake marketing, but utilises existing channels of distribution in a somewhat similar manner to that adopted by the Cheese Board, with the exception that, in the case of the Butter Board, the agents are directly appointed by the Board. In practice the Board seeks a nomination from the factories as to the agent which the respective factories desire, and under ordinary circumstances appoints such nominee as a Butter Board agent.

The Australian Butter Stabilisation Scheme came into operation on the 1st January, 1926. Under this scheme provision is made for a levy on all butter manufactured, to provide a bonus on all butter exported. The scheme operates under agreements which are entered into between the dairying interests of each of the butter-producing States.

# Hand-Rearing of Calves.

(Revised.)

By T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

The continued progress of the dairy industry in this Colony depends almost entirely on the ability of would-be dairy farmers to obtain good cows, and success or failure will depend on the kind of heifer calves raised. The size and thriftiness of the calf at birth depend very largely on the condition of the cow. There are large numbers of calves on farms in Rhodesia which, instead of showing improvement on the physical standard of their parents, show signs of degeneration, and it is too clearly apparent, if we consider our alarmingly high proportion of scrub cattle, that this degeneration is cumulative.

The care of the calf then really begins before it is born, and unless our dairy cows get sufficient and suitable food, not only whilst they are in milk, but also whilst they are in calf, both the cow and the calf must suffer. The need for the provision of succulent feed for cows in calf is not sufficiently realised, and many cows calving in October, November and December, because of the lack of this particular variety of feed (silage, sweet potatoes, majordas, pumpkins, etc.), give birth to calves which become even more miserable and undersized than their mothers.

Assuming that the calf is strong and thrifty at birth, the dairy farmer must make up his mind as to the policy which he is to adopt to get the most out of his cows. A simple arithmetical calculation will show him that if he is to go in for dairying as a business it will not pay him to hand-rear his bull calves unless they are to be kept for stud purposes.

A bull calf will easily consume on an average a gallon of fresh milk per day until he is six months old. Reckoning

milk to be worth 6d. a gallon, the bull calf will have cost in milk alone £4 10s., whilst other feed consumed will, at a low estimate, be valued at £1 10s. Thus the bull calf six months old for feed alone has cost £6. If the dairy farmer feeds him, herds him and dips him for another three years, he will be lucky (at present values) to get £6 for him.

As regards the dairy heifers, the case is entirely different. No effort should be spared to keep the heifer calf healthy and thrifty and in a condition to develop that roominess and capacity which is so highly desirable a feature in a dairy cow. The dairyman should realise that his dairy heifers are the foundation of his fortune, and a little extra trouble or expense will in the future give a rich reward.

**Treatment of a Calf at Birth.**—A heifer with her first calf, especially if she herself has been hand reared, as a rule is quite quiet, and does not fret if her calf is taken from her. The calf should be removed, placed in a small loose box, and rubbed dry. The navel string (or umbilical cord) should be tied with a carbolised silk thread, and the calf allowed to rest for an hour or two. The mother should be milked and the calf fed on a quart of the warm colostrum three times a day for a few days, and kept quiet in a warm, comfortable place.

With older cows, although there are exceptions, it is sometimes difficult to get them to milk without their calf, especially if, as is the general practice, the calf is left with the mother for about 48 hours. (This practice is specially to be commended if the calf is weak and undersized.) If the cow absolutely refuses to let down her milk without the calf having a few preliminary sucks, allow the calf to be present at the milking time, but see that it does not get more than a small quantity. The cow can be milked out and the calf fed from the bucket in the ordinary way. This practice applied to the rearing of heifer calves gives fairly good results, but the question is frequently asked: "What happens if the calf is a bull, and the cow refuses to milk without it?" This, of course, frequently happens, and has in the writer's experience been overcome by killing the calf, skinning it, and then rubbing the skin well with salt and partially drying it, stuffing it with hay, and placing it beside the cow's manger. The mother in many cases is quite pacified by having her calf's

skin to lick, and goes on milking for months. The trick does not succeed in every case, but it is well worth trying.

The calf will soon learn to drink from a bucket, especially if when thoroughly hungry it is allowed to suck the feeder's fingers, which are placed in the milk.

There are certain calf feeders consisting of a rubber teat and tube, which obviate the necessity of teaching the calf to drink. These are quite useful, but are difficult to keep absolutely clean and sweet. At the same time the rubber teats and tube are apt to perish and to crack. Although these rubber feeders are very useful, yet in the writer's experience quite as good calves can be reared on the bucket as by feeding by means of the teat.

**Rations for Calves.**—It is essential that calves be fed regularly, and that all utensils and bedding be kept scrupulously clean. It is also necessary to feed the correct amount of milk. An overfed calf is just as much to be pitied as one which is underfed, as overfeeding leads to digestive troubles and scours, whilst the results of underfeeding are made manifest by the appearance of the calf, its unthriftiness and lack of size. Very young calves should be fed separately and kept in a separate calf shed or loose box until they are at least a fortnight old.

It is assumed that the average dairyman wishes to rear his calves as cheaply as is consistent with good results being obtained, and in that case we shall assume that separated milk is as far as possible utilised for feed. Of course, if pedigree stock is being raised it is always advisable to give unseparated fresh milk as long as it is available. Some breeders give fresh milk until the calves are a year old, but for average purposes milk is fed for about seven months. The calf is then weaned.

It is very advisable to use a milk scale to ensure that the amounts fed are correct. It should be remembered that a gallon of milk weighs 10 lbs., and that the weight of a quart is 2½ lbs., and that of a pint 1¼ lbs.

In the absence of a milk scale a quart measure is indispensable.

*1st Week.*—One quart mother's milk three times a day, given warm.

*2nd Week.*—One to one and a half quarts of milk, not necessarily that of the mother, given warm three times a day.

*3rd Week.*—One and a half quarts new milk, plus one pint newly separated milk, given three times a day.

*4th Week.*—Discontinue the mid-day meal, because at this time, or earlier, the calves will have begun to nibble at fine, well-got hay, and will also have begun to eat some concentrates, such as mealie meal, ground oats and ground nut cake. Feed therefore two quarts fresh milk and one quart separated milk twice a day.

*5th Week.*—Feed one quart of fresh milk and two and a half quarts separated milk, supplemented with linseed or munga porridge, twice a day.

Continue for three more weeks, feeding twice a day, giving increasing quantities of separated milk, until in the ninth week the calves are entirely on separated milk, supplemented with linseed porridge. The calves should continue to get fine, well-got teff or veld hay. If lucerne hay is available, this should also be fed. Give a mid-day meal of about ½ lb. of a mixture of mealie meal, bran and either crushed oats or ground nut cake. A salt lick should also be provided.

When their digestive organs are sufficiently developed at about twelve weeks on a diet similar to that outlined, a small ration of from four to five pounds of succulent feed such as mangolds or pumpkins should be given. The rations should be continued until the calves are about four months old, when the milk ration can be gradually reduced, and this may be altogether omitted at an age of seven months. By this time the calves should be grazing in a well-shaded camp with a good water supply. If separated milk is available, give it to the calves until they are a year old, as it is a splendid food, and calves grow out much more quickly and attain earlier maturity if its use is continued.

*Preparation of Porridge.*—Two pounds of linseed should be soaked overnight in three gallons of water. Next morning this should be boiled for about 20 minutes, and then about half a pound of fine mealie meal previously made into a paste should be stirred in. The addition of mealie meal is for the purpose of giving the mucilage more body and for preventing the porridge from being unduly laxative. The mixture

should be allowed to cool, and will remain fresh for two or three days. One part of porridge should be mixed with four parts of separated milk and well stirred in. The sediment should not be thrown away, but should be fed to older calves or to the cows. Kaffir corn, munga or mealie meal porridge should be made in the same way, *i.e.*, by always soaking the meal or grain overnight. The amount fed depends on the age and development of the calf, but the proportion should not exceed one part of porridge to three parts of milk, unless the calves are well grown.

*Solid Feeds for Calves.*—It should be emphasised that it is absolutely necessary to keep young animals in a growing and thrifty condition. Their growing period is a comparatively short one, and the time is too short for them to make up for any severe set-back caused by disease or lack of food. A stunted animal is never profitable, and in all animal breeding early maturity, obtained by ample food and good treatment, should be aimed at. Besides the feeding of milk and its supplements, it is essential to make provision for the development of the paunch or rumen by feeding roughage or bulky feeds. When the calves are about three weeks old they will begin to nibble at fine and well-got hay. Teff hay is perhaps the most suitable for young calves, but for older animals lucerne and velvet bean hay are greatly relished, although these should be at first sparingly fed, as excessive quantities may cause scour.

For the feeding of roughage or concentrates a simple feeding trough or manger should be put up in the run. Uneaten roughage or concentrates should always be removed before next feeding time, as calves do not relish stale feed.

*The Feeding of Concentrates.*—Maize meal, oats (ground or crushed) and kaffir corn (ground) are all useful in calf rearing, but should never be fed alone, but rather mixed with a more appetising food such as bran or ground nut cake. A mixture of wheat, bran, ground nut cake and maize meal should be fed at a rate of from a half to one pound per calf per day, according to the age or size of the calf. This can be given as soon as the calves begin to nibble at teff or lucerne hay.

*Feeding Whey to Calves.*—As the cheesemaking industry is progressing rapidly, it is interesting to learn that older

Showing arrangement of stanchions. This is especially effective if large numbers of calves are to be fed.

Calves being fed individually at Gwebi farm.

Group of hand-reared young bulls at Gwebi farm.

calves can be successfully reared on whey if this food is supplemented by the addition of a cake rich in protein, such as cocoanut or ground nut cake. Calves, however, should not get whey in place of separated milk until they are at least five weeks old. The whey should be fed fresh and warm, and is better if it is scalded and cooled down to 100 degrees. The scalding process of course sterilises the whey and destroys harmful bacteria.

**Organisation required in the Feeding of Calves.**—The hand-rearing of calves should be treated as a part of general farm routine, and special accommodation should be built for the calves. Nothing on the farm looks so unsightly and out of place as hand-reared calves or lambs hanging about the kitchen door, picking up scraps and generally becoming a nuisance. If only two or three calves are to be reared, then the organisation required is simple. A clean, airy, well-bedded calf pen with a small run attached is all that is necessary. Suitable shade is essential, as young animals ought to spend the greater part of their early existence eating and sleeping. Calves should not be turned out to run on the veld until they are at least three months old. Up to that age they should be kept in a run or well-shaded paddock provided with a good water supply. The longer the calves are kept in during the heat of the day the better they will thrive. The two illustrations of hand-reared calves show the result of this treatment. Calves treated rationally will at ten or eleven months show greater development in every respect than those which are treated in the ordinary way, and which are allowed to walk miles almost every day of their lives from the time they are a week old.

When there are numbers of calves to be reared, say from ten upwards, some organisation and equipment are required, so that each calf should be fed individually. We publish an illustration of a calf pen from an earlier article on this subject which seems to give very satisfactory results. Attached to the calf pen, however, should be a small run of about a quarter of an acre in which there is a small stack of fine hay at which the older calves can nibble, as well as a feeding trough in which the concentrates can be placed. The accompanying diagram represents a very simple arrangement of the calf shed, which minimises the trouble of feeding,

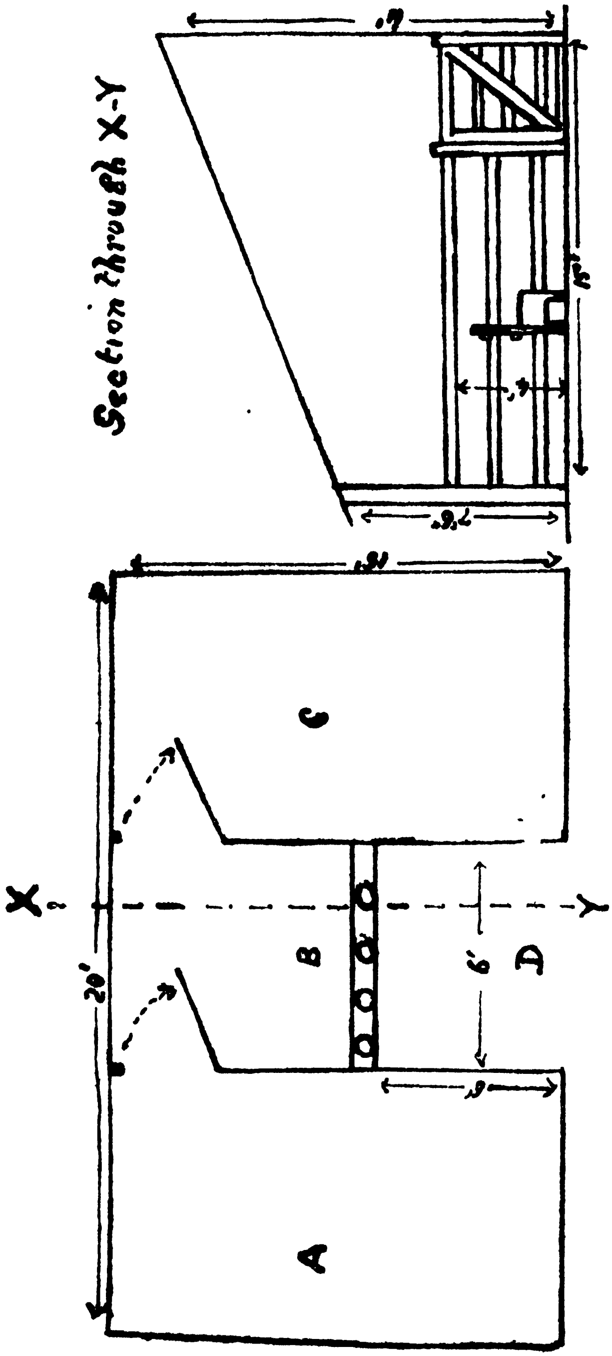
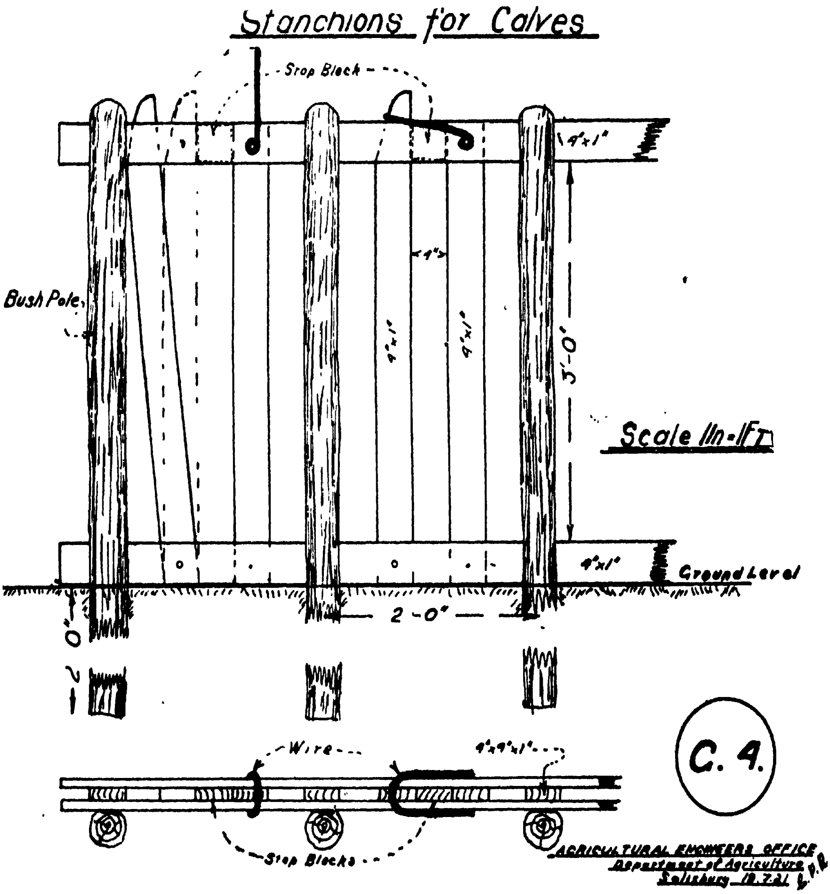



Diagram of calf house for use when hand rearing calves

eliminates error to a great extent, and is at the same time perfectly simple of construction. The dimensions given are those recommended as suitable and convenient for from 15 to 20 calves; but, provided the calves are not overcrowded and the shed is light, cool and airy, the dimensions need only be considered from the point of view of cost and convenience in building. The shed illustrated is one of the ordinary lean-to type, 20 feet long and 15 feet deep. The front is open except for a four-foot rail fence. This fence is so formed that a recess (D) 6 feet square is formed in the centre, giving access to a small manger capable of holding, say, four small buckets. The manger should be about 6 inches from the ground and have a couple of rails above it. The shed is then divided into three compartments, A, B and C, by the gates. At feeding time all the calves are driven into one compartment, say A, and the gate is closed. The milk, gruel, or skim milk is brought round in large buckets and placed in the recess D. The ration for the first four calves is then ladled into the buckets in the manger, and the calves in question allowed (by a piccanin at the gate) to come into the compartment B and drink. When they have finished they are driven through compartment C, and the next four are brought into compartment B, and so on. In practice one would bring all the calves of about one age forward first, and then those of the next age, in order to simplify dealing out the ration.

Another system which is strongly advocated is the construction of simple stanchions, such as is illustrated both in the photograph and in the diagram accompanying this article. These stanchions can be constructed from rough planks (packing cases are excellent for the purpose), and for standards bush timber can be used. When the movable rail is released the calves soon learn to put their heads through the opening. The rail is then swung up into position and fastened with a wire loop. The calf is then fast, and cannot move away without being released.

A row of stanchions can be built on each side of a central passage-way in the calf house, the bulls (in the case of pedigree animals) on one side and the heifers on the other. The attendant goes down the central passage and feeds four to six animals at a time. Petrol or paraffin tins cut in half, with the sharp edge of the tin hammered over, form excellent


Stanchions for Calves
Stop Block
4"x1"
4"
4"x1"
4"x1"
Bush Pole
3'-0"
Scale 1In=1Ft
4"x1"
Ground Level
2'-0"
2'-0"
Wire
4"x4"x1"
Stop Blocks
C. 4.
AGRICULTURAL ENGINEERS OFFICE
Department of Agriculture
Salisbury 19.7.21

feeding buckets, being cheap, easily cleaned, and difficult to knock over, especially if they are placed in a frame made of two planks fixed together with cross pieces just wide enough to allow the tin to be put in position or removed for the purpose of being washed. The great advantage of the stanchion system of feeding is that calves, if allowed to stand in the stanchion for some time after being fed, and thus to become dry, seem to have no inclination to suck one another, and thus the formation of hair-ball in their stomachs is to a large extent prevented.

**Inoculation of Calves.**—1. *Quarter Evil.*—This disease usually takes the best calves. Inoculate when the calf is one month old with vaccine obtainable from the Veterinary Research Department.

2. *Gallsickness and Redwater.*—Inoculate when the calves are three months old with vaccine obtainable from the Veterinary Research Department.

**Sickness Affecting Calves.**—*Scour.*—This is almost entirely a preventable disease, and calves which are hand-reared do not suffer from it in any such degree as those which are suckled. To prevent scour, the following precautions should be followed:—

(a) Do not overfeed.

(b) Feed milk at the proper temperature, *i.e.*, from 95 to 100 degrees F.

(c) Keep the feeding buckets clean. They should be frequently scoured and scalded.

(d) Feed newly-born calves with their mothers' milk only.

(e) Any change in the ration should be introduced gradually.

(f) Keep the bedding clean and dry.

(g) Keep the calves in a warm place away from draughts. Calves must always be kept dry.

*Treatment for Scours.*—

(a) Isolate bad cases, as some forms of scour are infectious.

(b) If symptoms appear, give the calf from two to four tablespoonfuls (one to two fluid ounces) of castor oil in a half pint of fresh warm milk.

(c) Cut down the ration.

(d) If the scouring continues after from four to six hours, give a full teaspoonful of a mixture of—

one part salol; two parts sub-nitrate of bismuth; two parts bicarbonate of soda.

(e) This dose can be repeated at intervals of from four to six hours until scouring ceases.

In any case of scour castor oil should first be given, and in the absence of the drugs named lime water or, as a homely remedy, a solution of half a square of washing blue made up in two bottles of warm water.

*Navel-Ill.*—Prevention is better than cure. Rub the navel with bluestone or apply a little iodine after tying up the navel cord with carbolised silk.

*Sweating Sickness.*—Isolate bad cases. Place calf in warm, clean pen. Dose with castor oil and rub calf with linseed oil.

*Ringworm.*—Soften the affected spots with soap and warm water to remove the crusts, and then paint with tincture of iodine.

**Dehorning Calves.**—This should not be practised if the calf is a pedigree animal. Dehorning should be done when the calf is from three to five days old by the application of caustic potash. The horn buds exist at the bottom of the depression, one on each side of the poll. To apply the caustic, remove the hair from the skin above the horn buds, moisten the potash slightly and rub it until the skin is white. One such treatment is usually sufficient to prevent the growth of the horns. Care must be taken to hold the calf tightly, so that the caustic is not applied anywhere else except on the horns.

## SUMMARY.

*Points to remember in hand-rearing calves.*

(1) Use a pure-bred sire always.

(2) Feed mother's milk only to calves under a week old.

(3) Always feed warm milk, *i.e.*, from 95 degrees to 98 degrees F.

(4) Do not overfeed.

(5) Feed regularly.

(6) Feed each animal individually.

(7) Keep everything clean, especially the feeding buckets and troughs. The buckets must be frequently scalded and the feeding troughs cleared of stale food before fresh food is put in.

(8) See that your calf shed has plenty of ventilation and is sheltered from cold winds. Lack of sunlight, fresh air and cleanliness is the chief cause of trouble.

(9) Keep the bedding clean and dry.

(10) Never allow the calves (up to three or four months old) to run on the veld. They should be kept in a small paddock where there is a small stack of teff or lucerne hay. Ample shade and good water are essential.

(11) Isolate any calves which are sick and place them in a cool, well-bedded loose box.

(12) Allow calves at all times to have free access to a salt-lick.

# Fattening for Beef at the Gwebi Farm.

By H. G. Mundy, Chief Agriculturist, and T. J. Needham, Accountant, Agricultural and Veterinary Departments.

The following report places before readers of the *Agricultural Journal* the results of last season's fattening for beef on the Gwebi farm, together with reliable figures of the cost of the feeding and the profits obtained.

Sixty-five head of bullocks were available for fattening, of which 41 head were purchased at a price of £5 10s. each. The latter were moderately large, cross-bred bullocks of no particular type, but in good store condition, and ranging from 4-5 years old. Of the remaining 24 head the majority were young grade Shorthorns and grade Devon bullocks bred on the Gwebi farm, the Shorthorn grades having been hand-reared calves to the age of six months, from which time until brought to the fattening pens at about two and a half years of age they had been entirely veld run without extra feeding. The farm-bred bullocks were taken in at a value of £5 apiece, and included under this heading were a few trek bullocks of 5-7 years of age which were not good workers and which it was therefore decided to fatten.

**Batch No. 1** consisted entirely of farm-bred Shorthorn grades which had been dehorned as calves. The original idea was to feed these for the Salisbury Show, and for this reason from the 20th January for about six weeks they were brought up morning and evening to the pens to receive a ration of concentrates. For the remainder of the time they were out grazing. The long feeding period which these animals enjoyed added considerably to the cost of fattening and reduced the profits, since it was finally decided to ship them as live cattle to

Great Britain. Had they been exhibited locally they would probably have won some prize money and might perhaps have realised better prices than they did in England.

**Batch No. 5** was also specially fed for exhibition purposes and was awarded first prize on the Salisbury Show in the class for a truck load of fat bullocks. These animals also, therefore, cost rather more than the average to feed, but won £10 in prize money, which is not taken into account when assessing profits. One purchased bullock contracted redwater and pneumonia and died after some weeks' feeding. The cost of the foods fed to this beast is included in that fed to one of the batches reported upon, and the value of the beast, namely, £5 10s., has been deducted from the profits shown in Table B. The two cows fattened were a pure-bred and a grade Friesland which, after breeding for some years, became sterile and were therefore fattened off for the butcher.

A study of Tables A and B discloses the fact that three of the bullocks were slow fatteners. Two were fed for 230 days and one for 258 days. The two showed a profit of only 10s. 6d. per head, and the third gave a loss of 19s. 8d. This experience brings into prominence the necessity for selecting as fatteners only the type of bullock which promises to be a good feeder. Unthrifty animals of this kind would normally be drafted out from the fattening yards and fattened on the grass during summer.

**Live Weights.**—The live weights of the two cows over the weighbridge in Salisbury prior to railing were 1,430 lbs. and 1,290 lbs. respectively. The live weights of the 18 bullocks in batch No. 3, whose feeding period closed on the 31st October, were 1,050 lbs., 1,210 lbs., 1,290 lbs., 1,440 lbs., 1,305 lbs., 1,212 lbs., 1,455 lbs., 1,215 lbs., 1,315 lbs., 1,110 lbs., 1,260 lbs., 1,250 lbs., 1,290 lbs., 1,065 lbs., 1,290 lbs., 1,290 lbs., 1,310 lbs. and 1,150 lbs. The weights of the 14 head in batches Nos. 4 and 4a were 1,355 lbs., 1,075 lbs., 1,090 lbs., 1,150 lbs., 1,195 lbs., 1,210 lbs., 1,110 lbs., 1,050 lbs., 1,225 lbs., 1,165 lbs., 1,065 lbs., 1,170 lbs., 1,055 lbs. and 1,110 lbs. The average live weight of the ten grade Shorthorn bullocks shipped to England was 1,175 lbs.

From the above figures it will be seen that many of the animals were on the light side, and the Johannesburg auctioneers, though commenting very favourably on the feeding and condition of the bullocks sold there, drew attention to the rather light weight of many of them.

**Costs of Foodstuffs.**—Where so much of the food used is home grown as distinct from purchased, and where a good deal of it is not actually saleable, the decision as to the values to be adopted is always open to criticism. Maize has been charged for at 7s. 9d. per bag, which is considered a fair price in view of the fact that inferior grain which would not have passed examination for export was used for feeding, and the price charged is for the grain only, provision for cost of bag not being required. Sunflower seed, again of inferior quality, is charged for at 8s. per 100 lbs., bean hay at 30s. per ton, ground nuts of low quality at 8s. per 75 lbs., maize and bean silage at 10s. per ton, and majortas at 10s. per ton. Most of these prices may be regarded as rather high, especially that for majortas, which crop is grown under the maize and really, therefore, entails no added expense over that for the maize except the cost of seed and the labour of collecting and carting the melons. Veld hay was given *ad lib.*, and no charge has been made for this, the value of the manure made —about two tons per beast—being set off against the cost of the hay.

Careful record was kept of the native labour employed in the care and feeding of the bullocks, and this is charged for at actual cost, as are purchased foodstuffs, condiments, medicines and fuel used for grinding the food. In charging up the cost of food supplied to natives employed in looking after the bullocks, food purchased has been charged at cost and that produced on the farm at fair average market value (*e.g.*, mealies at 7s. 9d. per bag, plus cost of grinding). The value of the open post and rail yards used for fattening has been taken at £100, and 5 per cent. interest has been charged on this figure for 300 days.

White wages in respect of European supervision of the feeding and management have been estimated on one and a half hours a day of the stockman's time at 1s. 8d. per hour.

**Feeding.**—The animals were fattened with the object of making the best profit possible, and in pursuance of the policy of working the farm as a commercial proposition. The foodstuffs used were weighed and recorded, but no record was kept of the dates when changes were made in the rations fed. Usually the time of fattening can be divided into two or three periods. Thus, in the case of Batch No. 1 there were the first six weeks or so when the bullocks only received a ration of concentrates night and morning; a second period, when confined entirely in the pens they received a complete ration; and, finally, the third or finishing off period. Table C sets out in detail all the foodstuffs consumed by each batch and the cost of these feeds, together, in the last column, with the total cost of all foods used and services rendered.

Table D shows the average daily ration of each food fed to each batch of bullocks, and, finally, the average daily ration consumed by all the animals. From the latter summary it will be seen that throughout the fattening period each beast consumed on an average per diem 5 lbs. of maize meal or crushed maize, about one-third of a pound of ground nut cake, a small amount of salt and bone meal, about one-seventh of a pound of sunflower and ground nut meal, approximately 2½ lbs. of bean hay and about 19½ lbs. of succulents consisting of maize and bean silage and majortas.

**Profits.**—The average profit, £3 10s. 7d. a head, made on the feeding can, on the whole, be regarded as a fair and reasonable one and by no means excessive. The grade Shorthorn bullocks were rather young for feeding, and would probably have paid better if held back until approaching four years old before being put up for fattening. Had they been sold locally or in the Union of South Africa, and had they not been rather forced for Show purposes, they would perhaps have shown a better profit. Omitting these ten head, the average profit on the remaining 54 beasts sold locally was £3 18s. 7d.

The direct profit made on the fattening should not, however, be regarded as the sole consideration. Some 130 tons of excellent farm manure were made, which is sufficient to give a reasonably good application of dung to 18-20 acres of land, and this manure will very appreciably increase the crop

returns from that land for the next three to four years. In addition, the produce of 15-20 acres of land planted to beans was profitably utilised, and the soil on which the beans were grown will benefit from the change of crop thereby introduced.

It is not suggested that the system of fattening here described and the feeds used are necessarily those which will give the best returns on all farms. The system followed is one which suits the particular conditions of the Gwebi farm. Other feeders will no doubt follow other methods and use somewhat different feeds, and it is quite possible that by doing so the cost of feeding can be reduced.

Acknowledgment is due to the manager of the Gwebi farm and his staff for the carefully-kept records of all the operations entailed in the fattening of these bullocks.

## TABLE D.—Showing Average Daily Rations Fed (lbs. weight).

NOTE.—Those batches which were specially fed for different reasons do not appear in this schedule.

| Batch No. | Maize. | Ground Nut Cake. | Salt. | Bone Meal. | Sunflower Seed. | Bean Hay. | Majordas. | Ground Nut. | Silage. |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 5.589 | .554 | .083 | .017 | .085 | 1 885 | 8.198 | .028 | 6.209 |
| 2a | 4.439 | .183 | .074 | .028 | .141 | 2.809 | 14.066 | ... | 10.807 |
| 3 | 4.494 | .162 | .074 | .030 | .125 | 2.888 | 13.196 | ... | 10.125 |
| 4 | 5.492 | .492 | .077 | .019 | .074 | 2.012 | 7.826 | .023 | 6.012 |
| 4a | 5.277 | .145 | .066 | .027 | .112 | 2 863 | 12.166 | ... | 9.490 |
| Total | 25.291 | 1.536 | .374 | .121 | .537 | 12.457 | 55 452 | .051 | 42.643 |
| Average | 5.058 | .307 | .075 | .024 | .107 | 2.492 | 11.090 | .026 | 8.529 |

# A Ridger and Fertiliser for Tobacco.

By Messrs. Bickle Bros., Mhanweni, Nyamandhlovu.

The ridging and fertilising of tobacco lands by ridging plough and hand fertilisation is quite one of the major expenses in the production of tobacco. It is also a lengthy operation, and time is most valuable at that period of the year when it is carried out.

A most efficient ridger and fertiliser can be constructed at very little cost from implements which every farmer and tobacco grower possesses, namely, a maize planter with fertiliser attachment and two cultivators.

It is necessary to fit a draw bar to some solid part of the back of the planter, and to this the cultivators are attached. A 14 lbs. fencing standard clamped on with square shackles is quite strong enough. Two stays of No. 8 wire should be fastened from the ends of the standard to the fore part of the planter for reinforcement.

Two holes are punched in the standard, one behind each wheel and three feet apart, to take four or five links of small chain, to which are hooked the cultivators.

The cultivators are stripped of all shanks or legs, except the two extreme side ones which work on swivels and usually have ridging shovels attached. In the ordinary course of events these ridging shovels are set to throw the earth outwards to form a half ridge on either side. In order to get them to throw up a complete ridge inwards towards the centre they must be changed about, the right shovel being put on the left foot, and the left on the right foot. This is an important point. Larger shovels than those usually supplied with the cultivators are necessary to make a large enough ridge. The shovels will have to be adjusted until the correct angle is obtained. The width of the ridge is regulated by the expanding lever on the cultivator.

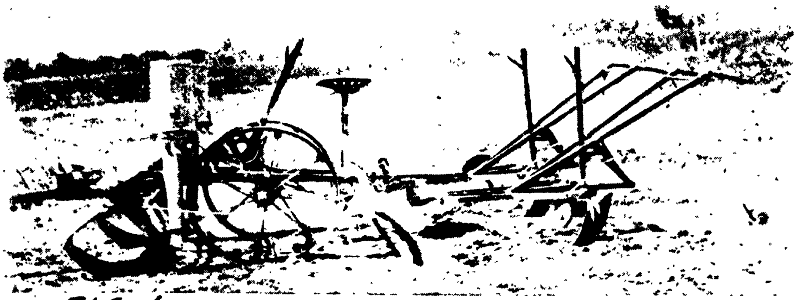


FIG. 1.

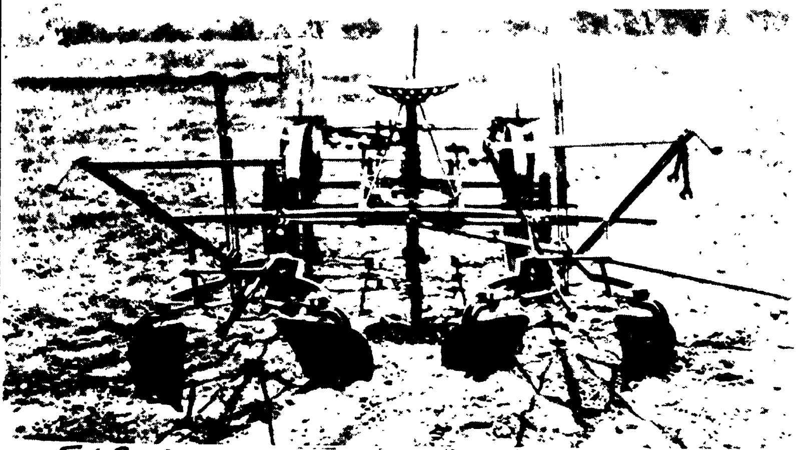


FIG. 2.

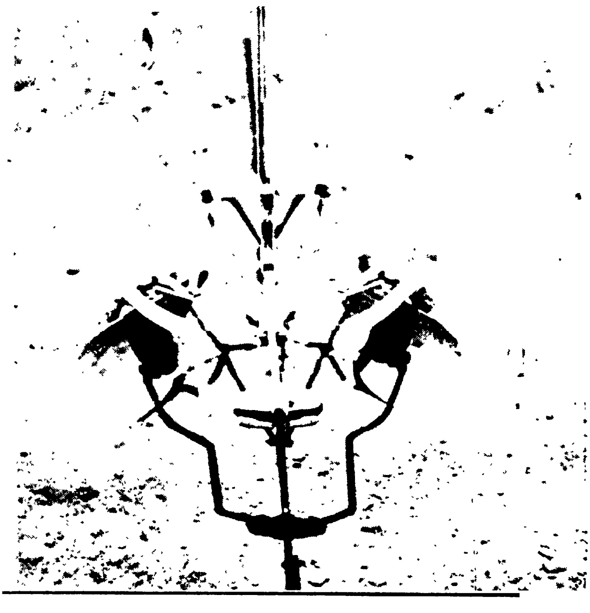


FIG. 3.

Fig 1. Side view of ridger and fertiliser for tobacco.
Fig. 2. Rear view.

The planter is run with the knife coulters about two inches in the soil,. so that the fertiliser is just under the surface. The cultivator follows and makes the ridge immediately over the wheel mark of the planter. With the coulters of the planter running as shallow as two inches it may be necessary to put extensions on the tubes which drop the fertiliser to prevent the wind blowing it away. This difficulty is easily overcome.

It is essential to have the soil in a good tilth, and preferably a little moist, to obtain the best results. In wet soil the shovels become clogged and drag the soil instead of heaping it up. The right results should be two good, flat-topped ridges with a smaller ridge in between.

Four oxen can manage the outfit comfortably. A good even speed should be maintained, as the ridgers work best going fairly fast. Behind a tractor it would work admirably. With oxen six to seven acres per day can quite easily be done, provided soil conditions are good. Five hands are required. They are: a lead boy, a driver, two boys to work the cultivators and one to operate the planter.

It has been argued that fertilising the whole of the ridge for Virginia tobacco is wasteful, because the plant does not get all the fertiliser. This is a false theory, for if the roots of a plant be examined when fully developed it will be found that they have spread all round for a radius of about 18 inches. The fertiliser is actually more beneficial distributed thus, because the roots are spreading throughout the growth of the plant and thereby feeding continuously from the fertiliser.

From land ridged and fertilised by this method the writer obtained a crop of tobacco yielding 1,200 lbs. per acre of bright and medium leaf, with only 100 lbs. per acre of fertiliser. This success is not attributed solely to the method of ridging, but serves to prove that it is by no means detrimental.

It might be mentioned in conclusion that the planter used is a Ransomes' "Pilot" and the cultivators "Planet Juniors" (5-tine). The agents for the latter are Messrs. Copthall Stores, Ltd., Bulawayo, who have recently brought out ridging shovels of correct size especially for the purpose.

# Poultry Keeping in Rhodesia.

## PEDIGREE BREEDING.

By H. G. Wheeldon, Assistant Poultry Expert.

Pedigree records of the larger pure-bred animals are permanently kept and given official recognition in various countries by societies or associations of breeders. By means of these associations, herd books or flock books are kept, and the exact ancestry of the stock may be traced to the foundation animals of their strain. There are several reasons why this has not seemed feasible for poultry, but they are not important for the present purpose. The important fact is that it has not been done, although poultry keepers who aim for improvement are in greater need of breeding records than the breeder of larger farm animals. Further, the need of records is required because there is an increasing demand from breeders for stock that is pedigreed in regard to egg production. There is also ample scope for the development and maintenance of a high standard of excellence in the commercial flocks by methods of careful systematic breeding.

It is desired, through the inauguration of the Recording and Pedigree Breeders' Register for Poultry in Rhodesia, to initiate a uniform system of breeding, selection and general management with a view to placing the poultry breeding industry upon as sound a basis as possible. As a corollary to this it is desired to institute a system for keeping authentic records in place of exaggerated or often misleading claims of records as may be applied to birds which possibly have descended—in some cases many generations removed—from such strains or individual birds with famous records, and which have been lost in their descendants through a lack of proper breeding methods.

The keeping of pedigree records under some form of control and inspection that will provide for official checking and corroboration is considered to be of practical advantage to the specialist breeders and commercial egg farmers who desire to increase or maintain the producing qualities of their stock. The plant and the stock of all entrants in this register are under the supervision and subject to the inspection of Government officials. This supervision will be exercised in all phases of the work, such as the recording and mating of the birds, the incubation, the pedigreeing, brooding and rearing of the chicks and the environment of the stock generally, the object being to maintain a high standard in health and vigour and the standard qualities of the breeds. This should inspire breeders with a sense of security and give confidence to commercial egg farmers and beginners who desire to obtain pedigree stock for breeding from a reliable source and which are known to be directly descended from good, healthy pedigree laying stock. The register will, it is hoped, be one of the two great factors towards success in the poultry breeding industry, the other factor being " oneself." It should not be regarded as a competition among breeders, but rather as an aid to better and reliable breeding methods.

**Egg Production.**—Egg laying is a reproductive function, and it cannot always be successfully forced. The rate of production depends upon a hen's natural ability to produce, apart from many other factors, which are to a great extent controlled by environment and nutrition. The marvellous reproductive capacity of the hen to lay month after month when properly handled has led to a tendency to regard her as an " egg machine." Fowls, especially the heavy producers, are highly strung temperamentally, and they must be treated accordingly if they are to do their best, even in commercial flocks. For example, it is a peculiar fact, recognised by all careful poultry farmers, than hens like attention. They will respond to a marked degree in egg production where careful management and encouragement are given. On the other hand, the egg yield is certain to be unfavourably affected by rough handling and fright. Laying fowls require quiet and freedom from anything that is likely to molest or alarm them.

**The Laying Cycle.**—A clearly marked character in practically all good layers is the tendency to produce eggs in

long cycles and with a fairly regular rhythm. By " cycle " is meant the number of eggs produced without omitting a day, and by " rhythm " the frequency with which the cycle is repeated. Cycles may be short or long, and usually they vary a little with the season and treatment. A pullet which lays in uniform cycles and maintains it with uniform rhythm throughout the laying season, may be regarded as much more dependable as a breeder than a pullet which has a cycle and rhythm less uniform in character. A pullet with a record that has a longer cycle than either of the above two, but proves to be an inferior layer at the end of the season, may have a good second year record. But unless definite evidence could be produced to show that the bird was late in beginning to lay or ceased to lay early in the season through accident, environment or the moult, it should have no place in either the breeding or laying pens the second year.

**Broodiness** is the maternal instinct of the hen to set and hatch chickens. The system of the hen when broody undergoes certain changes, such as a rise in temperature, and the reproductive organs cease to function. Thus, frequent spells of broodiness are accountable for a decreased egg yield. This instinct has been entirely bred out of the light breeds of poultry, and there is a marked tendency to a lack of broodiness among the best laying strains of heavy breeds. When a hen goes broody she ceases to lay eggs and then remains on the nest without troubling about food. The longer a hen is left in this condition the longer it will take to regain her reproductive function, and there will be a loss of many eggs. The cure for broodiness is to isolate the affected birds promptly and feed them well in an airy broody coop. They should be fed on egg making foods, which should include an increased amount of meat meal, while grit, shell and drinking water must be provided just as if they were in the laying flock. When properly treated and promptly isolated hens will come on to lay again within two or three days, but if neglected and allowed to sit on the nest for several days and refuse to eat, it will take longer to cure them.

**Quality.**—Poultry farmers now-a-days as a rule seem to think solely of getting as many eggs as possible from each bird, regardless of any other consideration. Poultry farming is a business, and to place quantity before quality is unsound,

whether it is with eggs, chicks or adult stock. A larger number of stock is one means of obtaining increased returns, but other factors equally important are good management and feeding, and improvement in the fecundity of the stock by the production of strains of greater egg laying capacity. The aim is to develop strains that will produce first grade eggs in size, shape and quality for export, or eggs that will, when incubated, produce vigorous chicks that will mature and be healthy adults fit to lay or for breeding. It is important first to standardise and maintain by selection the size and shape of the eggs laid by the hens in the strains it is wished to establish. There is such a thing as standard requirements in eggs for hatching or export, just as there is a standard for the various breeds of poultry. The eggs required for incubation must be selected for type, that is uniformity in size or weight, shape, colour and texture of shell. Another important aim is to select and breed the birds according to the standard requirements of the various breeds or varieties of poultry. It is necessary for specialist breeders to become familiar with and to follow the requirements as set out in the standards of perfection. In this connection one of the important factors to consider in selecting birds is the "weight." A Leghorn hen, for example, should weigh 3½ lbs. to 4½ lbs. normally when matured. If a bird is lighter than this it is liable to lay undersized eggs, and will not have sufficient substance to make a desirable breeder. When the maximum weight of 4½ lbs. is exceeded efficiency may be lost.

**Strain.**—Breeding methods by which permanent success can be attained in producing valuable birds will consist in endeavouring to combine the desirable qualities of any given breed or variety of poultry. Breeding for one good quality only is simple; but as every breed of poultry possesses many good qualities the aim should be to combine these qualities by selection. When any single or combined qualities have become fixed and hereditary or capable of being transmitted for several successive generations within a family, this is known as a "strain." The strains or families within any given breed may, therefore, vary according to the aim in selection and breeding. Poultry breeders realise that profitable egg production depends largely upon the strain—that

some strains are heavy layers and others poor layers, no matter how closely or otherwise they may conform to the standard of the breed they represent even under careful management. It has been proved that desired qualities, whether combined or not, eventually become characteristic of a breed or strain when pure and such a strain is capable of transmitting any one or a combination of several characteristics. It is certain that any characteristics may be either eliminated or fixed according to the methods and aims in selection. With the knowledge possessed of the laying capabilities of bred-to-standard birds which are true in size, type and colour there should be no difficulty in maintaining these qualities and other standard requirements in the best laying strain. There is evidence that these qualities can be combined in individual birds or in the same strain and can be secured and maintained by constant selection of the breeding stock and the eggs required for incubation. This will tend to develop a general type or uniformity in accordance with the respective breeds of poultry, and the conscientious breeder, by continual breeding up, and guided by reliable records, should achieve success. It is important, if permanent success is to be obtained, to select the stock birds with a view to maintaining the standard requirements, and they should be mated according to modern principles with the object of fixing the breed characteristics while maintaining the qualities of profitable egg production. Then only can the qualities which constitute true utility be obtained.

**The Breeding Stock.**—Any system of improvement must begin with the breeding stock, as it constitutes the foundation of the industry. The breeding flocks of the Colony may be roughly divided into three groups. (1) Farm and commercial flocks, from which practically no hatching eggs, chicks or breeding stock are sold; (2) selected stock from farm and commercial flocks, which are used as breeders by farmers who are interested in the sale of eggs for hatching or day-old chicks and breeding stock without any efforts to record or pedigree their stock. The quality of the chicks produced from this class of stock varies and is determined in a large measure by the accuracy with which the stock is selected. The strain that produces chicks of poor quality is a menace to the industry.

Every effort should be made therefore to improve the quality of the ordinary breeding flocks used to supply eggs for hatching. General improvement may be obtained by mating easily available stock birds with good standard and egg producing qualities; (3) breeding flocks consisting of a relatively small number of birds of superior quality which are trapnested or single-penned, and with which pedigree breeding is carried out with a view to producing hatching eggs, baby chicks or stud stock of the highest possible quality. This work is painstaking and relatively expensive, but is very valuable, because the progeny are distributed and improve the quality of the stock in the Colony generally. Flocks of this group are called record or pedigree flocks.

**Pedigree Breeding.**—All promising pullets may be recorded at home, and individual records can begin as the birds naturally come on to lay without waiting for a set date, and with little disturbance, if any, to the birds. Accurate knowledge of the records and pedigree of the birds selected for breeding purposes is most important and helpful, but unless it is strictly accurate the value of it is trivial. The importance of reliable recording, followed by systematic selection and the proper mating of the birds, cannot be too strongly emphasised, as this is the basis of improvement through breeding. Anything that is likely to be doubtful in recording the eggs when trap-nesting or pedigreeing the chicks should therefore be avoided. Any inaccuracies in recording the annual production or in pedigreeing the chicks are likely to lead to failure or serious complications in the progress towards successful results.

During any given breeding season a promising male will be mated usually to several females, and in successive seasons a given female may be mated with more than one male. The breeding unit is the pair. A breeding pen is therefore a group of matings or pairs with the male a member of each pair, and it will be found that some females are suitable mates for a given male, while others just as good or even perhaps better individually and with as good a pedigree are not so suitable. In order to give proper consideration to the mating of birds accurate records should be available of the ancestry and results of former matings, apart from their individuality. In considering a given cockerel or pullet without a record as

a possible breeder, a knowledge of the breeding performance of each ancestral pair, as well as the productive performance of each related female, is a matter of importance, because, apart from the appearance of the bird in question and the appearance of its brothers and sisters, its pedigree is all one can be guided by with reasonable certainty. The breeder's aim, with the help of progeny records, is to find the best mating or pairs, and, when these are discovered, there is a real foundation on which to build and thus establish a special breeding flock. The secret in breeding should be to identify and breed from males or pairs of birds that produce pullets showing as much uniformity as possible in production. The best test of suitable matings will be found in the performance of the progeny. There is one sure method of judging the breeding value of a bird from the point of view of its transmitting capabilities or prepotency, and that is by the progeny test. This gives more dependable information than either the pedigree or the performance of the brothers and sisters of a particular bird. A good mating one season is likely to be as good a second season unless the vigour or fertility of the stock fail. Greater possibilities for improvement exist with a good prepotent male from a breeder's point of view, as the male is responsible for all the chicks produced by a given number of hens, and his good qualities may be transmitted more widely and more quickly in a given time. The composition of any outstanding male bird should, immediately it is recognised, be traced, and efforts made to secure a similar composition in other stock by careful selection and systematic breeding. It is recommended, in efforts to establish blood lines or families in a strain, to follow the line or composition of strains or families that year after year give the highest average uniform egg yield even if it is coupled with the misfortune of having to pass by or ignore the more outstanding layers in the main breeding lines. For example, it would be better on entering into three egg laying tests to be third in each of them than to be first in one and ninth and twelfth in the others. Outstanding birds in egg production must have other good qualities as well before being finally chosen for the main line of breeding. Remember always, it is not abnormal individual records gained at the expense of stamina, but uniformly high flock averages, combined with quality, breed type and vigour, that constitute true utility.

Having identified suitable matings, endeavour to find other suitable matings each year. Any outstanding females in egg production which have been rejected for the main breeding lines could be utilised to develop other lines, so as to establish other good families to follow on, in order to maintain a high level of excellence as a breeder of pedigree stock. These considerations, combined with the artificial incubation of eggs in large numbers, have necessitated the trap-nesting or single-penning of all mated females during the breeding season, and the marking of each egg so that the dam of each chick may be identified. It is also necessary, in completing the records, to sort out the eggs of each female before hatching, and to arrange for marking and identifying each chick with the dam and to keep a record chart of the mating. By means of this record chart the chicks can be identified also with the male or sire. The chicks may be separated when hatching in the incubators by means of pedigree cages or muslin bags and identified by toe punching or, preferably, wing banding.

A point that also requires consideration is the mating. This is usually made for an entire season, but if for some reason it is desired to change a mated male bird or to mate a given female with more than one male during any breeding season, and at the same time to be sure of all the progeny of each male, it is necessary to leave the female unmated for a period of three weeks before introducing the second male. Full brothers and sisters of a single season may be hatched on different dates, and those hatched during the early part of the season are more desirable as breeders the following year. It is therefore an advantage to make the dates of hatching a part of the record.

**Recording Production.**—There is but one method by which a breeder can determine the egg record of a fowl, and that is by counting the number of eggs laid. This may be done by accurate trap-nesting or by the use of single pens. The individual egg record gives an opportunity to study the monthly and yearly production with its daily cycles and pauses, and is preferable simply to keeping the monthly or yearly totals of individual birds. A record sheet is required for the egg production of each succeeding month. The record books to be used in this register have been designed so that

the daily, monthly and annual summary of individual birds may be kept together in book form, thus giving a permanent and complete record. All the birds to be recorded must be carefully selected and ringed with the official sealed numbered leg bands which will be supplied to each entrant.

*Trap Nests.*—There are several designs of trap nests that are considered to be infallible, but they must not be regarded as entirely reliable. They are designed to allow only one hen to enter at a time, and, when once in the trap, the hen cannot get out until released. No means have yet been found for identifying individual eggs as laid, except by making it impossible for the hens to leave the nest until released. This furnishes an opportunity for reading the leg band number and recording it on the eggs as laid, from which the numbers are entered later in the egg record book. The number of eggs that may be laid on the floor can be reduced to 3 per cent. by careful daily attention to the trap nests and the laying flock. The eggs that are found outside the trap nests should not be recorded, or, if they are incubated, the chick should remain unpedigreed on its dam's side. When trap-nesting the breeding stock, one of the greatest problems from the point of view of pedigree is the eggs that are found on the floor and wrongly credited. The eggs of individual hens may be kept separate in the incubators and the chicks suitably marked when hatched with numbered wing bands so as to be able to trace at all times the ancestry of every individual in the flock. Such information is obviously indispensable in all reliable methods of recording.

*Single Pens.*—To test pullets in single pens, housing accommodation must be provided, and when heavy and light breeds are kept, one of each breed may with advantage be placed together in one pen. Single pens are preferable to trap nests for recording the pullets, and, wherever possible, the adoption of single pens is to be recommended, owing principally to the nervous temperament of pullets. They will do better if given quiet and freedom, and there will be less possibility of inaccuracies in recording, due, in the case of trap-nesting, to pullets laying their eggs outside the trap nests. Some breeders consider that the health of the birds is affected by the single-pen system. Accumulated data, however, indicate the opposite, but much depends on the feeding

and method of management, as with other stock. Plans of single pens and trap nests may be obtained on application to the Department of Agriculture.

**Breeding Records.**—To keep a complete breeding record or pedigree of a flock the four following essentials are required:—

(1) *Individual Egg Records.*—It is necessary, if the selection of the breeding birds on a sound basis is to be simplified, to record not only the egg production of the first year, but to keep a record of any other qualities possessed by the pullets, such as broodiness in light breeds. the frequency of broodiness in the heavy breeds, and the constitutional qualities. A knowledge of these points would be helpful in the selection of the breeding stock, and help to eliminate any bad qualities which are likely to become hereditary or fixed in a strain. Only the birds that have gone through at least one laying year can be reasonably relied upon as breeders. There are occasions when it may be necessary to save time, in which case untested pullets may be used as breeders while they are being trap-nested or single-penned; but in such cases it is necessary at the end of the laying period to discard from the pedigree line the progeny of the birds which set up a poor record or are otherwise unsatisfactory for breeding.

(2) *Record of each Mating.*—A mating record is a chart showing particulars of the birds in any given breeding pen and is most useful for future reference. To make a record of the mating, the individual birds must be marked. The method adopted is by numbered leg and wing bands, the particulars to be entered on a chart. A convenient mating chart will be supplied for record purposes, which will provide for entering the details of the male at the head of the pen, and also for one or more males held in reserve as substitutes. Provision is made for twelve females in the pen, followed by their mating numbers and yearly egg records. If the mating number of either sex is unknown this may be indicated in the space by writing the word "unknown," or in the case of pullets being mated the word "pullet" must be written in the column under egg record. On the same chart provision is made for a record of the progeny from all the mated females.

(3) *Pedigree of Sire and Dam.*—Particulars of the sire and dam's record, progeny and pedigree should also be kept. It is necessary to know the ancestry of each, or their pedigree, their progeny, and to record details relating to individuality or breeding performance. In pedigree hatching the wing band number should be noted as well as the leg band number. Leg bands are likely to wear out and be lost, especially in the case of male birds. The wing band number is always to be found elsewhere in the breeding record, so that any bird losing its leg band can be definitely identified, even if the bird is not known by the breeder. To give proper consideration to the mating of birds it should be possible to study the results of former matings of all individual birds previously used as breeders. For this purpose there must obviously be available a list or record of all matings and the performance of their progeny. The pedigree of a male or female used as breeding stock should be completely recorded for at least four generations. In beginning a pedigree record system, unless one purchases foundation stock from someone who has kept breeding records, this is, of course, not possible. As the successive generations follow, however, an increasingly complete record may be given. It cannot be too strongly emphasised that the breeding value of any individual is most accurately judged by the character of his or her progeny. In breeding for high egg production the egg records of a given male's daughters are of particular value in forming a judgment concerning that male. The importance of the records of his granddaughters by his sons must also not be overlooked. It is a very human tendency to over-emphasise the importance of a few successful daughters and under-emphasise the importance of the unsuccessful ones. The pedigree record should show every daughter and the egg record of each succeeding breeding season.

(4) *Pedigree Hatching.*—The eggs which are gathered from the trap nests in the breeding pens should be marked with the number of the hen and the number of the pen, on the small end of the egg. It is necessary to mark the eggs on the small end, because the chick, when hatching, is likely to destroy any other part of the egg shell. The eggs from the different pens or those from different hens may be placed together in a rack suitably divided and marked according to

the leg band number of breeding hens, and once each week or ten days the eggs should be set. When filling the incubator trays it will be found convenient to place the eggs of individual hens together, and the ordinary practice in incubating must be followed until the eighteenth day with one exception —the eggs may be tested on the eighteenth day instead of on the customary fourteenth day. The reasons for this delay are that a number of embryo chicks die between the fourteenth and eighteenth days, and they can then be removed. On the eighteenth day all the eggs of each mated hen should be divided in the pedigree tray or muslin sacks or wire cages, whichever are used. These should be suitably labelled and so arranged that the chicks cannot escape after hatching. This will provide means for identifying the chickens with their dam and thus wing banded accordingly. If muslin sacks are used they may be fastened at the open end with a safety-pin to which also a label with particulars of the eggs can be attached, or with wire cages, and then arranged in regular order in the incubator drawer ready for hatching.

A convenient method of keeping the wing bands in order is to string them on a piece of wire so that the numbers run consecutively. When the chicks have dried off after hatching, they should be individually wing banded as they are taken from the pedigree trays, each wing band number being entered opposite the band number of the parents or mating number in the chick record book. Such wing bands will serve as a permanent record for future reference, and remain there during the life of the bird. If properly done, the insertion of the wing band causes little discomfort with little bleeding, and they very seldom need any further attention. Wing bands are sometimes apt to slip round the joint of the wing when the chicks are very young, and observation may be necessary from time to time among the newly-hatched chicks. The wing bands must be numbered consecutively by all breeders, beginning with No. 1 each season, also, if possible, the year date on each band in small numbers. In this way there can be no confusion through using the same consecutive numbers each season. Owing to the smallness of the wing band it is not desirable to have large numbers. It will save time if, before the chicks are due to hatch, the wing band numbers are entered consecutively in the "chick record" in

advance. It will then be necessary to enter only the mating number of the parents and the hatching chart number in the column next to the wing band number of each chick, thus identifying the chicks on hatching with their parents. At a later date, when convenient and when the chicks are leg banded, the progeny and flock breeding record sheets may be completed from the chick record book. It will be necessary for breeders to purchase numbered wing bands as required.

Leg bands are necessary in addition to wing bands for marking and recording the stock, because although the latter is an accurate means for identifying individual birds it is not a quick nor a convenient means for frequent recording purposes, as in the case of trap-nesting. The wing bands being small, and thus hidden under the wing feathers of adult birds, they are difficult and inconvenient to read, and on this account mature birds are selected and marked a second time with sealed leg bands. Separate leg band and wing band numbers also facilitate accurate means for checking and tracing purposes. It is desirable not to have the leg and wing band numbers corresponding on the same bird. Another important consideration is the leg band numbers should not be duplicated. Suitable leg bands for adult stock will be supplied to all entrants under this scheme.

The leg bands used for the males are distinguished from those used for the females by an embossed letter "M" following the embossed number of the ring. This distinction is convenient when reading the numbers on the record sheets, as the sex of the bird will be self-evident by the numbers. For example, the leg band of the sire which heads the pen is 100M, and the number of the dam mated to this sire is No. 10, therefore the mating number of the progeny from these birds would be 100M 10, a combination of the sire 100M and the dam 10, which will be a convenient basis for tracing pedigrees. A lightly stamped letter which denotes the breeder or entrant will be found on the ring next to the rivet. For convenience in reading the numbers when trap-nesting, the leg bands should be put on so as to be upside down when the bird is standing. It will save time in reading the numbers when trap-nesting if the band is always placed on the left leg.

**Selection of Breeding Stock.**—*The Hens.*—The advantage of keeping individual records will be appreciated as the time approaches for a careful consideration of the relative merits of the birds for breeding purposes. If such records are not available the selection is made by observation, which is less reliable than details of performance. It is desirable to know, as far as possible, the periods at which the pullets begin to lay after hatching, as well as the periods at which they go into moult or cease production, their periods of broodiness and the total number of eggs laid during the season. A record of the weights of the eggs laid should be considered in conjunction with the numbers, as the size or general suitability of the eggs is of importance where the character of the egg is concerned. It is wise to give preference to the large egg layers and to eliminate the layers of small eggs. When the selection for the breeding pen is based upon the required combination of favourable factors, and not on the egg yield only, there is no reason why the best layers should not also be the best breeders. Good hatching and rearing results may be obtained from birds of exceptional laying qualities, as proved from the history of some notable egg-laying strains. When birds lose tone or become unsuitable for breeding purposes, after setting up a good record in egg production, the fault, more often than not, may be sought in the method of management rather than with the actual record of production. If vigour and general constitutional qualities are neglected in the early selections, good results cannot be expected, and this applies to the poor layer as well as to those with the best records.

*The Cockerels.*—Many poultry farmers use cockerels to a considerable extent for breeding purposes, and even where cockerels are used to a limited extent tor breeding the first year it is necessary to select and reserve a certain percentage for sale or to be retained as future sires. Any guide in selecting the best cockerels, therefore, has a double value. The selection of cockerels on their dam's annual record alone is not sufficient, nor is it as accurate as compared with the method of calculating the inherited production from the average annual egg production of the dam of both parents for a number of previous generations. The average annual production of the hens in the dam's pedigree and the average annual record of the hens in the sire's pedigree may be considered

of equal value in so far as determining what the daughters from such matings will produce. There is possibly no method of selecting the cockerels to be used as breeders for increased egg production that is as satisfactory as the combined sire's and dam's inherited production behind such cockerels. The sire's record should show every daughter and her record for each succeeding season that it is mated.

*The Cocks.*—Too much emphasis cannot be placed upon the importance of making full use of the breeding males possessing standard qualities and ability to sire heavy egg-producing pullets, especially with uniformity in production. High production pullets from the flock may be traceable to a very few outstanding males, and this applies also in the breeding of other domestic animals. The cocks may be selected both on the pedigree production basis and on the progeny test. The daughters of a yearling cock will have been recorded for a few months by the time of his second mating season, if he was used as a cockerel. The yearling cock can therefore be selected with some degree of certainty with a view to determining the influence he is likely to make on the flock as a breeder. As a two-year-old, such a bird will be a tested individual, and if he possesses vigour and good prepotent qualities he can be used successfully, if properly handled, for two or more mating seasons. Points to be followed in the selection of males are: (1) Choose those with a high inherited production, both on the sire and dam sides, for as many generations as possible; (2) whose progeny have shown the best laying qualities; (3) from families or blood lines that show an absence of broodiness, that are free from a tendency to long periods of non-production in the laying cycle; (4) those whose pullets show a high rate of uniform production.

One of the simplest methods commonly adopted by breeders is to choose males for breeding purposes from hens showing the highest egg record. The production of such matings usually give good breeding cockerels. The records of the daughters of a sire will usually indicate his value as a breeder of good or poor layers, and also his prepotency. If they are better than his mother and their mothers, improvement is naturally taking place, and those that show the best improvement should be used as breeders the following year.

# The Cylindrical Metal Maize Sheller.

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Since the article on the above subject appeared in the October issue of the *Rhodesia Agricultural Journal*, Mr. Adams has received numerous letters asking for further particulars. The following notes cover all the points raised, and are published for general information:—

**Engine.**—

*Make.*—Fairbanks' Morse, " Z " type.

*H.P.*—6 to 7 at coast. It is reckoned to develop 5½-6 here.

*Motive power.*—" Power " paraffin.

*Starter.*—Petrol.

*Ignition.*—Totally enclosed wet proof Bosch magneto.

*R.P.M.*—450.

The engine is made up in two main sections:—

1. Cast iron base, which is bolted down to a concrete foundation or to a portable steel frame. This section contains the paraffin tank, holding approximately six gallons.

2. Upper casting bolted on to No. 1. This includes cylinder block and all bearings.

The cylinder is horizontal, with valve in head. Bolted above the cylinder head is a water hopper for cooling purposes. Two heavy flywheels are operated on the main shaft, and to one or both of these wheels the drive pulley or pulleys are fastened, 10 inches diameter being standard on this engine. Timing and governor gears are worked by cogs from the main shaft.

The engine is equipped with a very efficient " mixer " for starting and running. About half a cup of petrol is poured into the proper container, and the engine is started by a swing of a handle. After a few revolutions, and when the firing is steady, the paraffin is gradually turned on and the petrol turned off. The paraffin is drawn into the cylinder

head by suction. The whole arrangement works thoroughly well, but requires a little care with throttle adjustments until the correct "rhythm" or beat is familiar. Bearings are lubricated by pressure grease cups, and the cylinder is oiled by adjustable oil drop from a glass container. The finish, workmanship and assembly are good, and the component parts are constructed of heavy material. The complete engine weighs about 700-800 lbs. When the engine is running correctly it will carry on for hours with no smoke from the exhaust and a quiet thud from the explosion.

The agents are Copthall Stores, Bulawayo. Cost, without portable truck, approximately £75. Truck, extra, about £10. Cost of running per hour on power paraffin with average farm load, 1s. approximately. Power paraffin costs 15s. per case if purchased in ten case lots.

**Feed Grinder.**—The grinder is made by the Fairbanks' Morse Engineering Company, to go with their 6 h.p. paraffin engine. It is known as the type "B" feed grinder.

The grinder is all metal. It consists essentially of two steel grinding plates (which are common to most grinders), and on the same shaft a breaker, which, being in spiral form, forces the broken pieces of whatever you are grinding into the plates. I may say that when I first started the outfit I was disappointed, but after a time found that the fault was mine and not the machinery. Like every other gadget, one has to know how to work it. I am perfectly satisfied now.

Appended are a few notes on grinding which may be helpful:—

**Corn and Cob.**—It is essential that the corn and cob be bone dry, otherwise it will be found that the whole mill will jam up and the belt slip on the pulley. It is better to break up the meal coarsely first and put it through a second time for fine grinding, when a very nice meal will be produced at about two bags per hour. This should cost about 6d. per bag.

A good scheme is to tie a sack over the hopper and cut a hole in the middle and feed through the sack, otherwise cobs and mealies will jump out all over the place. Break the corn and cob to the average size of a mealie first, and then put it through again. This is the secret of turning out good stuff.

**Crushed Maize.**—A special plate is supplied which is fitted in the hopper. This cuts out the spiral breaker and gives an inclined plane direct to the grinder plates. The hopper is filled with maize. Have the mill running before putting the grain in. Adjust the grinder plates to the required degree of fineness, and start the mill, keeping the hopper full. It will grind from about six bags per hour, decreasing as fineness is increased, without any trouble whatever.

**Mealie Meal.**—The writer has never been able to turn out a really fine meal, such as is termed No. 2. It is necessary to sieve the meal after grinding. The making of mealie meal is a slow job, turning out almost a bag an hour at approximately 1s. per bag. In this respect the mill has not proved too good. I prefer to have my milling for native mealie meal done at the local mill.

**Ground Nut Meal.**—This refers to nuts with shells on. Put them in the hopper a little at a time, sufficient to prevent the machine "idling," and there will be no trouble; it turns out a beautiful meal. It is essential to dismantle the plates and clean up after running with ground nuts, as everything becomes coated with the oily paste.

**Charcoal.**—As for corn and cob meal. Break it first and regrind. Make sure there is no uncharred wood. Do not use pieces of charcoal thicker than the average maize cob.

**Sunflower Leaf or Ground Nut Hay.**—Adjust to required degree of fineness and stuff the matter to be ground into the hopper; the machine will do the rest. An old mealie cob or sunflower stalk is useful to poke the material to the bottom of the hopper occasionally.

*Any other grain as for maize.*

**Points to Note.**—

Belt.—Distance between driver and driven pulley should be not less than 15 feet. Use a belt not less than four inches wide.

Belt fasteners.—The claw arrangement is best and cheapest.

Belt slip.—The belt will stretch in hot weather and horse power will be lost. Arrange the plant so that the mill or

engine, or both, can be drawn back and thus tighten the belt. My engine is on wheels and grinder fixed. I just haul the engine back and wedge it firmly in position.

An excellent " dope " for the belt is to put ½ lb. resin in a tin (coffee tin is useful), add any old engine oil, heat over red-hot coals and stir well. As the belt is running apply this " dope " hot with a stick to the inner surface. The " dope " should be of the consistency of golden syrup when hot. Only very little is required occasionally.

Be sure that all the grease cups are full and are not blocked up with dust and meal. I ran a bearing red hot by neglecting this. The bearings, etc., are quite efficient. It was my fault.

Mount the grinder on a cement base if possible, and bolt it down.

**Steel Sheller.**—This is fairly completely dealt with in the October number of the *Rhodesia Agricultural Journal*, and there is very little to add. It is of British manufacture and design, and is made by—

Messrs. Ransomes, Sims and Jefferies—they call it the " Moon " sheller;

Messrs. Garett, Ltd.—sheller known as the "Garett" cylindrical sheller;

Messrs. North and Sons stock it under the name of the "Acme " cylindrical sheller.

The agent for Garett's sheller is the Copthall Stores, Bulawayo.

Extra equipment can be purchased in the way of hopper feeding mechanism, bagging device, and so on, but these are hardly essentials, and cost almost as much as the sheller itself.

I do not think that the stockists themselves really know the capabilities of this sheller. It successfully handles at least three major crops, the secret being the high speed beating on the revolving drum, combined with centrifugal force, which tends to throw the grain away from further damage once it is released.

# Rules for Tree Planting.

By T. L. Wilkinson, M.Sc., B.Sc.F.,
Assistant Forest Officer.

1. Trees obtained from a distant nursery should be brought from the station or siding and planted without undue delay.

2. Choose dull, showery weather for planting operations. Avoid working on dry, hot or windy days.

3. Plant in properly prepared soil. If possible, ploughed in January-March, cross ploughed in October-November, and subsequently harrowed. The finer the tilth, the better the start the trees will get.

4. If the land has not been ploughed, and small plants are used, dig square holes early in the rainy season, remove all sticks, stones and roots liable to form air cavities when the holes are filled in.

5. When filling in the holes use surface (fine) soil. Only the best and freshest soil should come into contact with the roots.

6. See that the root system is good—bushy, fibrous roots being preferred. Discard plants with poor root systems, as the plants will only fail at a later date. Cut back roots where too long, making a clean cut.

7. Do not break the roots when transferring the plants from the tray to hole. This also applies when transferring from the seed bed. Do not expose the roots to the wind or sun. Do not firm the earth into a ball about the roots when the plant is transferred from the tray, since this has the effect of binding the roots, and prevents rapid spread of the roots.

8. Place the roots of the young tree in a natural position. Do not twist or bunch them or place them in one vertical

plane. *Avoid bending the tap root; it means death to the plant.*

9. Place the young trees in the ground at the same depth as they occupied in the trays or nursery bed, making due allowance for the settling of the soil. The colour of the stem will indicate the correct depth. Failure to observe this rule is one of the primary causes of non-success. Covering with soil any of the part of the stem above the collar interferes with the free flow of food supplies which have been elaborated by the chlorophyll in the leaves. A layer of soil covering the bark above the collar prevents the lenticles from performing their normal functions, and intercepts and prevents the food stream reaching the roots. The latter, in consequence, are unable to supply the leaves' demand for water, and the whole plant is enfeebled and falls a prey to termites.

10. In setting the plant in the hole the stem should be given an upright position, the roots spread out, and the earth brought into contact with the roots and well firmed, particularly at the base.

*Note.*—In windy weather the swaying of the young tree is apt to work an open space around the stem. This space must be filled up before the weather becomes dry, otherwise too much air will be admitted to the roots, and the plant will die.

11. One plant should be set in each hole.

12. The smaller the planting stock, within reason (6 to 9 inches), the less expensive, the quicker and the more certain will be the results, provided that the trees are able to withstand the planting operations. Larger stock will not withstand the shock of transplanting so well.

13. Stock or game are most injurious to young trees, and must be kept out by fencing if other satisfactory methods cannot be taken.

14. When the site is inclined to be waterlogged, due to free water near the surface or to other causes, the trees should be planted above the general level of the surrounding soil.

15. In exceptional circumstances, when the site is very dry, due to soil or climatic conditions, the trees may be planted in saucer-shaped depressions below the general level

of the surrounding soil, so that greater advantage may be taken of the rainfall.

16. In planting on steep slopes a step-like niche should be made and the plant set deep in the niche. The soil removed in making the niche should be placed on the lower side of the opening.

17. Remember, first and last, that the tree is a living thing. It thrives with good treatment, struggles for existence when indifferently treated, and dies when neglected.

# Review.

## FRUIT GROWING IN SOUTH AFRICA.

By R. A. Davis (Central News Agency, 27s. 6d.).

The author, who is a recognised authority on fruit growing in South Africa, is to be congratulated on his latest work, which meets a long-felt want. Within a compass of 500 odd pages the author presents a wealth of valuable information which deals with every phase of fruit growing. He has the gift of lucid expression, and is thus able to make his meaning clear to the veriest tyro. The chapter dealing with the development of the fruit industry from its early beginning in the Cape of Good Hope to the present time, when fruit growing is a source of great wealth to the Union of South Africa, is of absorbing interest.

We can thoroughly recommend this book to anyone interested in fruit growing, be he student, a grower of fruit on a commercial scale, or the owner of a small home orchard.

# Movements of New Settlers.

The following new settlers arrived in this Colony during the month of November, 1928:—

R. T. Kenward.—Arrived from Great Britain on 1st November and proceeded to East Clare Estate, Que Que, for a period of training.

C. J. Bouwer.—Arrived from the Union on 2nd November on tour of inspection.

A. Salkinson and daughter.—Arrived from the Union on 6th November on tour of inspection.

Mr. and Mrs. R. E. Furness.—Arrived from Nyasaland on 9th November on tour of inspection.

Mr. and Mrs. P. G. Cookson.—Arrived from Great Britain on 13th November and have occupied Kirkly Vale farm, Rusape.

Mr. and Mrs. F. B. Beckingham.—Arrived from Great Britain on 14th November and are with Mr. J. Beckingham, Donnybrook, Salisbury.

A. F. Davidson.—Arrived from Northern Rhodesia on 19th November on tour of inspection.

J. W. Higginson.—Arrived from the Union on 21st November on tour of inspection.

J. W. Harland.—Arrived from Great Britain on 23rd November and proceeded to Mr. J. Elsworth, Chikurubi, Salisbury, for a period of training.

Captain A. G. Waller and Mr. Waller, sen.—Arrived from India on 29th November and are with Captain B. C. Waller on Pangula farm, Salisbury.

# Correspondence.

*[No responsibility is accepted by this Journal for the views expressed by correspondents.]*

The Editor,

*Rhodesia Agricultural Journal.*

Sir,

*Chinchilla and Angora Rabbits.*

I should like to make one or two remarks about the article appearing in the November issue of the above journal entitled "Chinchilla and Angora Rabbits."

The article states that dressed and pulled pelts were offered in England at 7s. 6d. to 8s., less 6 per cent. discount. In this case why do the British Fur Board repeat their offer of 10s. for undressed skins? This offer appears weekly in *Fur and Feather.*

The advice given is to " send small lots." I have by me a letter dated 13th October, 1928, from one of the leading breeders and wool farmers in England, who is also a member of the Fur Board. He advises the formation of a co-operative society out here and the marketing of the pelts in bulk. Failing this, he recommends that individuals should have the pelts made up into clothes, ties, collars and cuffs, etc., by a furrier, and then sell them as made-up articles. A fur coat requires 36 skins.

The information regarding Angora wool contains a statement that might easily be misunderstood, i.e., " Manufacturers prefer the wool to be as long as possible, and attach much more importance to this characteristic than to the fineness of staple." From this one might be led to think that long hairs were required rather than smooth, silky hairs. This is not so. What is required is an average length of 2½ inches, with the longest hairs going 3 inches, of good white colour, and the texture to be fine and silky. *Long, overlength coats of coarse hairs are of very little value.*

I note that the article also states that " buyers will not take less than one hundredweight." I have a letter from Mr. Browne, manager of the Derwent Mills, Ltd., saying that parcels of one pound will be accepted. This could be sent very cheaply, whereas one hundredweight would be an awkward and large parcel to send, and the very thought of saving one hundredweight would deter many people from farming Angoras. Eight ounces is the average yield per animal per annum; therefore, to obtain one hundredweight would require 224 woolers, if the amount was to be collected in one year.

EDGAR S. EVERETT, Captain.

Hovere Farm, Banket,
16th November, 1928.

[The information published in the November issue of the Journal was supplied to us by the Imperial Institute.—ED., *R.A.J.*]

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The Editor,
*Rhodesia Agricultural Journal.*

Sir,

*Check-row Planting of Maize.*

I am grateful for the article on " Check-row Planting of Maize " (as for many another article) in the November number of the Journal.

You ask for particulars of other methods which have been effective.

Last year I wanted to try check-row planting, but, having no printed information, I did what seemed to be the most obvious thing—marked out the field with the planter two ways. This worked satisfactorily, and I am using the same method for all planting this year.

With ox-traction the marking is not so mathematically correct as would be the case if working the scheme you outline, but it is at least as true as ordinary one-way planting with the machine. Seed boxes and chain drive can be disconnected from the planter if so desired.

There are limitations, but if the ground is worked as under your heading (2) these are greatly, if not entirely, diminished.

If there has been careless ploughing of the borders of the field, the field can still be sown to the limit of the ploughing, even should the boundary be semi-circular.

As to the amount of work done per day, this week one boy and three picannins have marked two ways a 20-acre field with the machine; 20 schoolboys, mostly small boys, have planted this acreage in ten working hours, ten of them walking ahead with a hoe, each digging holes, and ten following them planting four seeds in each " hill " and covering with soil by the foot. I am quite satisfied with this speed, and possibly it is equal to normal work of boys employed by the farmer, since the schoolboys invariably work well when planting their food.

The harrow follows immediately on the planting.

The above scheme seems to work in practice, and to be an economy of time in the first instance of sowing, compared with the scheme you outline; whilst, later, a good deal of time is saved in the use of the cultivator two ways instead of one.

I am, etc.,

A. F. S.

P.O. Namwala,
Northern Rhodesia.

[We are pleased to publish this interesting letter. To mark out the lands with a planter in the manner described it is necessary that the seed bed be well prepared and fairly free of any large clods.—Ed., *R.A.J.*]

# Southern Rhodesia Veterinary Report.

## October, 1928.

### AFRICAN COAST FEVER.

One case occurred on the infected farm Morgenson, Melsetter district.

### ANTHRAX.

One outbreak occurred in cattle in the Salisbury district, and one death on a previously infected farm in the Shamva district. The total mortality was three head. All in-contact animals were inoculated.

### TRYPANOSOMIASIS.

A slight mortality amongst stock in the Hartley district was reported.

### HEARTWATER.

A mortality of over 30 per cent. occurred in a herd of cattle moved to an area in the Gwanda district infested with the bont tick.

### SCAB.

In the Umtali district one flock was placed under licence.

### GENERAL.

Stock throughout the Colony are suffering severely from the effects of the drought, and heavy losses are occurring in most districts.

### TUBERCULIN TEST.

No re-actions occurred amongst the animals tested on importation.

### MALLEIN TEST.

No re-actions occurred amongst the animals tested on importation.

## IMPORTATIONS.

From the Union of South Africa: Bulls, 72; cows, 4; heifers, 21; horses, 14; mules, 22; donkeys, 8; sheep, 1,322; goats, 425; pigs, 20.

## EXPORTATIONS (CATTLE).

To the Union of South Africa: For local consumption, 775. To Belgian Congo: For slaughter, 1,478; for breeding, 43. To Portuguese East Africa: For slaughter, 38; for transport, 14; for breeding, 22.

## EXPORTATIONS (MISCELLANEOUS).

To Northern Rhodesia: Donkeys, 14; sheep, 212; goats, 62. To Belgian Congo: Pigs, 91.

## EXPORTATIONS TO BELGIAN CONGO: IN COLD STORAGE.

Carcases: Beef, 144½; pigs, 19; sheep, 40; ox hearts, 116; ox tongues, 167; ox tails, 155; sheep hearts, 170; sheep tongues, 175; ox livers, 149; sheep livers, 81; tripes, 119; ox heads, 119; ox brains, 61; sheep brains, 66; ox sweetbreads, 29; calves' feet, 36; poultry, 621.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

# Southern Rhodesia Weather Bureau.

## NOVEMBER, 1928.

**Pressure.**—During the month the barometric pressure was high, particularly in the east, varying from 0.052 inch above normal at Umtali to 0.007 inch above normal at Salisbury.

*Movements of Highs and Lows.*—Eight highs visited the country during the month, and the movements were generally abnormal. On the 1st and 2nd a high was off the east coast. A high appeared on the south coast on the 4th and was off Beira on the 6th and 7th. The third high appeared off the south coast on the 12th and remained off Beira from the 14th to the 16th. The fourth high appeared off the south-west coast on the 13th, and joined the previous high at Beira on the 15th. The fifth high appeared on the south-west coast on the 16th, and was off Beira from the 18th to the 22nd. The sixth high appeared on the west coast on the 21st, moved round the coast, and was off Beira on the 24th. The seventh appeared on the west coast on the 24th and was off the south-west coast on the 25th and 26th. The eighth high was very weak, and affected pressures on the south coast from the 27th to the 30th. The outstanding factor during the month was the almost permanent high pressure at Beira and the absence of intense highs which usually occur in November.

*Lows.*—The outstanding factor during the month was the absence of lows on the south-west coast. Southerly lows appeared on the south-east coast and were never in evidence for more than two days. Northerly lows were active, but never of great intensity. The period of rain at the latter end of the month started with the movement of a low which appeared on the east coast on the 21st and moved inland to South-West Africa.

**Temperature.**—The temperature during the month was high, the mean monthly temperature varying from

4.5 degrees F. above normal at Tuli to 0.7 degree F. below normal at Riverdene North, Victoria. The highest mean maximum for the month occurred at Tuli, 102.8 degrees F., with two days at 120 degrees F.

Minimum temperatures were generally above normal, varying from 3.1 degrees F. above normal at Enkeldoorn to 0.3 degree F. above normal at Riverdene North.

Humidity was generally well below normal.

**Rain Periods.**—Rain fell during two periods in November, from the 4th to the 13th, and the 22nd to the end of the month. The first period was associated with the passage of two lows along the east coast; the second period was initiated in the same way, and continued owing to the presence of a northerly low immediately to the north of Rhodesia.

On the 4th and 5th scattered showers in Mashonaland; on the 6th and 7th showers were general in Matabeleland; on the 8th rain was general, on the 9th in Mashonaland only, and on the 10th in north-east Mashonaland; on the 11th to 13th clearing showers occurred. On the 22nd and 23rd numerous showers occurred, followed by general showers in south Matabeleland on the 24th. Showers were general on the 25th and 26th; scattered showers fell in north-east Mashonaland on the 27th. Rain was general in north Mashonaland on the 28th, and on the 29th and 30th numerous showers were reported in the north.

**Rainfall.**—The rainfall for November amounted to 3.03 inches, as compared with the normal of 3.24 inches. The seasonal total is 3.15 inches, as compared with a normal of 4.21 inches.

The distribution was as follows:—

| Zone. | Rainfall, Nov., ins. | Normal, Nov., ins. |
|---|---|---|
| A ... ... ... ... ... ... ... | 2.80 | 3.06 |
| B ... ... ... ... ... ... ... | 3.36 | 2.51 |
| C ... ... ... ... ... ... ... | 3.15 | 3.45 |
| D ... ... ... ... ... ... ... | 3.29 | 3.68 |
| E ... ... ... ... ... ... ... | 2.68 | 3.59 |
| F ... ... ... ... ... ... ... | 2.61 | 4.97 |

From the above it appears that the deficiency is most marked in the eastern portions of Mashonaland.

# RAINFALL.

| Station. | 1928. Oct. | 1928. Nov. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone A.:** | | | | |
| Bubi— | | | | |
| Bembesi Railway | ... | 2.18 | 2.18 | 3.27 |
| Glenarton | ... | ... | ... | 2.77 |
| Inyati | .06 | 2.20 | 2.26 | 3.51 |
| Judsonia | ... | 1.61 | 1.61 | n.s. |
| Martha Farm | ... | 1.86 | 1.86 | 2.69 |
| Nduba Farm | ... | 1.55 | 1.55 | n.s. |
| Shangani Estate | ... | 2.08 | 2.08 | 3.03 |
| Bulalima-Mangwe— | | | | |
| Centenary | ... | 3.41 | 3.41 | n.s. |
| Kalaka | ... | 3.69 | 3.69 | 2.93 |
| Riverbank | .03 | 2.59 | 2.62 | 2.84 |
| Solusi Mission | ... | 2.82 | 2.82 | 2.74 |
| Bulawayo— | | | | |
| Fairview Farm | .. | 4.05 | 4.05 | 3.24 |
| Keendale | ... | 3.14 | 3.14 | 2.96 |
| Lower Rangemore | ... | ... | ... | 3.01 |
| Observatory | ... | 3.40 | ... | 4.11 |
| Waterworks | ... | 3.88 | 3.88 | 3.68 |
| Gwelo— | | | | |
| Brockenhurst | .33 | 3.69 | 4.02 | n.s. |
| Frogmore | .29 | 2.75 | 3.04 | n.s. |
| Gwelo Gaol | .26 | 4.24 | 4.50 | 4.31 |
| Riversdale Estate | .13 | 1.74 | 1.87 | 4.05 |
| Somerset Estate | .10 | 2.61 | 2.71 | 3.64 |
| Insiza— | | | | |
| Orangedale | ... | 1.69 | 1.69 | 3.30 |
| Shangani | .04 | 1.88 | 1.92 | 2.83 |
| Thornville | .01 | 3.61 | 3.62 | 2.81 |
| Nyamandhlovu— | | | | |
| Gwaai Reserve | .04 | 5.77 | 5.81 | 2.03 |
| Gwaai Siding | .01 | 4.27 | 4.28 | n.s. |
| Naseby | 02 | 3.16 | 3.18 | 3.21 |
| Nyamandhlovu Railway | ... | 3.69 | 3.69 | 2.64 |
| Sebungwe— | | | | |
| Gokwe | .05 | 3.69 | 3.73 | 3.54 |
| Umzingwane— | | | | |
| Springs | .01 | 3.64 | 3.65 | 3.12 |
| Wankie— | | | | |
| Dett | ... | 3.77 | 3.77 | 2.81 |
| Matetsi Railway | .03 | 1.83 | 1.86 | 3.08 |
| Ngamo Railway | .09 | 4.40 | 4.49 | 2.60 |
| Rosslyn | .02 | 1.16 | 1.18 | n.s. |
| Sukumi | .23 | 2.45 | 2.68 | 2.31 |
| Tom's Farm | .20 | 1.27 | 1.47 | n.s. |
| Victoria Falls | ... | 1.61 | ... | n.s. |
| Victoria Falls Railway | .33 | 1.29 | 1.62 | 3.40 |
| Wankie Hospital | .01 | 1.56 | 1.57 | 2.42 |

## RAINFALL—*(Continued)*.

| Station. | 1928. Oct. | 1928. Nov. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone B.:** | | | | |
| Belingwe— | | | | |
| Bickwell | ... | 1.56 | 1.56 | 3.56 |
| Sovelele | .10 | ... | ... | 1.80 |
| Tamba | .20 | ... | ... | 2.54 |
| Wedza | .12 | ... | ... | 2.12 |
| Bulalima-Mangwe— | | | | |
| Bruwapeg | .23 | 2.33 | 2.56 | 3.58 |
| Edwinton | ... | 6.14 | 6.14 | 3.70 |
| Empandeni | .10 | 4.23 | 4.33 | 3.46 |
| Fallowfields | .07 | 3.33 | 3.40 | n.s. |
| Garth | ... | 4.17 | 4.17 | 3.97 |
| Maholi | .10 | 4.95 | 5.05 | 3.95 |
| Retreat | .01 | 3.36 | 3.37 | 3.37 |
| Sandown | .06 | 3.22 | 3.28 | 3.60 |
| Semokwe Reserve | .14 | 2.43 | 2.57 | n.s. |
| Tjankwa | .03 | ... | ... | 4.57 |
| Tjompanie | .19 | ... | ... | 3.36 |
| Chibi— | | | | |
| Bubye | ... | ... | ... | 2.33 |
| Mtendelende | .17 | ... | ... | 2.60 |
| Nuanetsi Homestead | ... | ... | ... | 2.67 |
| Nuanetsi N.C. | .11 | 4.05 | 4.16 | n.s. |
| Gwanda— | | | | |
| Gwanda Gaol | .08 | 3.47 | 3.55 | 3.06 |
| Limpopo | ... | ... | ... | 3.52 |
| Mazunga | .24 | ... | ... | 3.08 |
| Mtetengwe | ... | 1.93 | 1.93 | 2.39 |
| Tuli | .20 | 4.12 | 4.32 | 2.91 |
| Insiza— | | | | |
| Albany | ... | 2.21 | 2.21 | 3.16 |
| Filabusi | ... | 3.64 | 3.64 | 3.24 |
| Fort Rixen | ... | ... | ... | 2.88 |
| Inyezi | ... | 2.22 | 2.22 | 2.55 |
| Lancaster | .05 | 3.62 | 3.67 | 2.71 |
| Scaleby | ... | 2.23 | 2.23 | n.s. |
| Wanezi Mission | ... | 1.52 | 1.52 | n.s. |
| Matobo— | | | | |
| Bon Accord | .03 | 3.35 | 3.38 | n.s. |
| Fort Usher | .05 | 5.35 | 5.40 | n.s. |
| Holly's Hope | .11 | 4.41 | 4.52 | 2.63 |
| Longsdale | ... | 2.76 | 2.76 | n.s. |
| Matopo Mission | ... | 5.59 | 5.59 | 3.41 |
| Mtshabezi Mission | .04 | 4.89 | 4.93 | 3.21 |
| Rhodes Matopo Park | ... | 3.56 | 3.56 | 3.81 |
| Umzingwane— | | | | |
| Balla Balla | ... | 3.57 | ... | 3.10 |
| Essexvale | .03 | 2.61 | 2.64 | 2.45 |
| Hope Fountain | ... | 2.53 | 2.53 | 4.31 |

## RAINFALL—(*Continued*).

| Station. | 1928. Oct. | 1928. Nov. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE C.: | | | | |
| Charter— | | | | |
| Bushy Park ... | ... | ... | ... | 4.31 |
| Enkeldoorn ... | ... | 3.07 | 3.07 | 4.61 |
| Marshbrook ... | ... | ... | ... | 4.43 |
| The Range ... | ... | 2.27 | 2.27 | 4.87 |
| Vrede ... | ... | 1.86 | 1.86 | 4.39 |
| Chilimanzi— | | | | |
| Beacon Hill ... | .19 | 2.21 | 2.40 | 2.75 |
| Central Estates ... | .13 | 2.60 | 2.73 | 4.82 |
| Fourie's Post ... | ... | 2.13 | 2.13 | 3.21 |
| Orton's Drift ... | ... | 1.94 | 1.94 | 3.68 |
| Sebakwe Post ... | .15 | 1.31 | 1.46 | 3.51 |
| Umvuma Railway ... | ... | 1.97 | 1.97 | 4.25 |
| Gwelo— | | | | |
| Cross Roads ... | .34 | 1.62 | 1.96 | 3.72 |
| Delano Estate ... | .29 | 3.23 | 3.52 | n.s. |
| East Clare Ranch ... | .10 | 2.27 | 2.37 | 2.65 |
| Forestvale ... | .79 | 4.85 | 5.64 | n.s. |
| Globe and Phœnix Mine ... | .56 | 2.88 | 3.44 | 3.79 |
| Lannes Farm ... | .07 | ... | ... | n.s. |
| Lalapanzi ... | .42 | 2.43 | 2.85 | 4.65 |
| Lyndene ... | .16 | 2.22 | 2.38 | 3.07 |
| Woodendhove ... | .19 | 3.40 | 3.59 | 3.18 |
| Wold Farm ... | .40 | 3.70 | 4.10 | n.s. |
| Hartley— | | | | |
| Ardgowan ... | ... | 2.48 | 2.48 | 3.85 |
| Balwearie ... | .12 | 2.17 | 2.29 | 3.11 |
| Battlefields ... | ... | 2.19 | 2.19 | 3.55 |
| Beatrice ... | ... | 6.17 | 6.17 | 5.03 |
| Carnock ... | .02 | 6.78 | 6.80 | 5.32 |
| Cromdale ... | ... | 4.09 | 4.09 | 4.97 |
| Currandooley ... | ... | 2.51 | 2.51 | n.s. |
| Eiffel Blue Mine ... | ... | 2.49 | 2.49 | 3.17 |
| Elvington ... | ... | 6.42 | 6.42 | 4.43 |
| Gatooma ... | .10 | 1.81 | 1.91 | 4.10 |
| Gatooma Experiment Station | .04 | ... | ... | n.s. |
| Gowerlands ... | ... | 6.01 | 6.01 | 4.97 |
| Handley Cross ... | .17 | 2.47 | 2.64 | n.s. |
| Hartley Gaol ... | .28 | 2.76 | 3.04 | 4.66 |
| Hopewell ... | .20 | 3.86 | 4.06 | 4.73 |
| Jenkinstown ... | ... | ... | ... | 4.89 |
| Maida Vale ... | ... | 1.84 | 1.84 | 2.41 |
| Meadowlands ... | .20 | 5.39 | 5.59 | n.s. |
| Nyadgori ... | .17 | 2.76 | 2.93 | 4.90 |
| Pulham ... | .05 | 3.50 | 3.55 | 5.49 |
| Ranwick ... | .17 | 3.37 | 3.54 | 4.59 |
| Sunny Bank ... | ... | 2.07 | 2.07 | n.s. |
| Thorndyke ... | .57 | 1.57 | 2.14 | 4.86 |

## RAINFALL—(*Continued*).

| STATION. | 1928. Oct. | 1928. Nov. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE C.—(Continued) | | | | |
| Lomagundi— | | | | |
| Argyle ... | .05 | 3.39 | 3.44 | 4.32 |
| Baguta ... | .07 | 4.84 | 4.91 | 4.44 |
| Between Rivers ... | .58 | 2.79 | 3.37 | n.s. |
| Citrus Estate ... | .13 | 4.92 | 5.05 | 3.77 |
| Dalston ... | .35 | 1.93 | 2.28 | n.s. |
| Dartmoor ... | .22 | 3.40 | 3.62 | n.s. |
| Darwendale ... | .80 | ... | ... | 4.40 |
| Devonia ... | .01 | 3.83 | 3.84 | 4.20 |
| Dingley Dell .. | ... | 2.17 | 2.17 | 3.44 |
| Gambuli ... | ... | 2.98 | 2.98 | 4.83 |
| Hartleyton ... | ... | ... | ... | n.s. |
| Kapiri ... | .04 | 1.33 | 1.37 | 3.79 |
| Kashao ... | .04 | 2.96 | 3.00 | n.s. |
| Kenidia ... | .13 | 4.74 | 4.87 | n.s. |
| Mafoota ... | .04 | 1.79 | 1.83 | 3.76 |
| Maningwa .. | ... | 3.11 | 3.11 | 4.08 |
| Miami ... | .07 | .91 | .98 | n.s. |
| Mica Field ... | .12 | .33 | .45 | 1.78 |
| Montrose ... | .15 | 4.26 | 4.41 | 3.44 |
| Mpandegutu ... | .31 | 4.27 | 4.58 | 4.33 |
| Msina ... | ... | 2.54 | 2.54 | n.s. |
| Mukwe River Ranch ... | .02 | 1.40 | 1.42 | 4.21 |
| Nyapi ... | .11 | 6.48 | 6.59 | 3.69 |
| Nyarora ... | .07 | 1.62 | 1.69 | 3.64 |
| Nyati ... | .24 | ... | ... | 3.26 |
| Palm Tree Farm ... | .02 | 1.76 | 1.78 | 3.52 |
| Pendennis ... | ... | .79 | .79 | n.s. |
| Raffingora ... | .01 | 1.28 | 1.29 | 3.27 |
| Renardia ... | .05 | 2.97 | 3.02 | n.s. |
| Richmond ... | ... | 2.86 | 2.86 | 2.88 |
| Robbsdale ... | .20 | 2.64 | 2.84 | n.s. |
| Romsey ... | ... | 3.06 | 3.06 | 3.72 |
| Silater Estate ... | .07 | 1.76 | 1.83 | 4.80 |
| Sinoia ... | .14 | 4.96 | 5.10 | 4.10 |
| Sinoia's Drift ... | ... | ... | ... | n.s. |
| Sipolilo ... | ... | 2.46 | 2.46 | 3.95 |
| Umvukwe Ranch ... | .02 | 1.40 | 1.42 | 4.69 |
| Woodleigh ... | .10 | 3.72 | 3.82 | 3.60 |
| Yeanling ... | .01 | 1.46 | 1.47 | 3.53 |
| Zebra Vlei ... | .07 | 2.07 | 2.14 | 3.72 |
| Marandellas— | | | | |
| Rocky Spruit ... | ... | 5.45 | 5.45 | n.s. |
| Mazoe— | | | | |
| Pembi Ranch .. | ... | 2.11 | 2.11 | n.s. |
| Salisbury— | | | | |
| Avondale (Broadlands) ... | .37 | 2.77 | 3.14 | 4.27 |
| Ballineety ... | .04 | 3.17 | 3.21 | 4.25 |
| Botanical Experiment Station | .33 | 3.48 | 3.81 | 4.45 |
| Bromley ... | .09 | 3.98 | 4.07 | 4.79 |

## RAINFALL—(*Continued*).

| STATION. | 1928. Oct. | 1928. Nov. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **ZONE C.—(Continued)** | | | | |
| Salisbury (continued)— | | | | |
| Cleveland Dam ... | .02 | 1.99 | 2.01 | 4.30 |
| Forest Nursery ... | .20 | 3.83 | 4.03 | 4.46 |
| Gwebi ... | .18 | 3.11 | 3.29 | 4.13 |
| Salisbury Agricultural Dept. | .35 | 3.06 | 3.41 | 4.46 |
| Sebastopol ... | 1.03 | 4.82 | 5.85 | 4.93 |
| Stapleford ... | .02 | 3.83 | 3.85 | 5.40 |
| Tobacco Experiment Station | .19 | 2.11 | 2.30 | n.s. |
| Western Commonage ... | .17 | 4.02 | 4.19 | 4.75 |
| Sebungwe— | | | | |
| Sikombela ... | .30 | 3.84 | 4.14 | 3.71 |
| Wolverley ... | .25 | 5.46 | 5.71 | 2.61 |
| **ZONE D. :** | | | | |
| Darwin— | | | | |
| Chikoa ... | ... | ... | ... | n.s. |
| Cullinan's Ranch ... | ... | 1.76 | 1.76 | n.s. |
| M'gadzi ... | .44 | 4.11 | 4.55 | n.s. |
| Mount Darwin ... | ... | ... | ... | 3.94 |
| Rusambo ... | ... | 1.20 | 1.20 | n.s. |
| Inyanga— | | | | |
| Inyanga ... | .31 | 4.81 | 5.12 | 4.91 |
| Juliasdale ... | .04 | 4.65 | 4.69 | 4.88 |
| Rhodes Estate ... | .25 | 5.86 | 6.11 | 5.88 |
| Makoni— | | | | |
| Ardlamont ... | .26 | ... | ... | n.s. |
| Eagle's Nest ... | .17 | 5.86 | 6.03 | 4.92 |
| Mayo Ranch ... | .72 | 2.02 | 2.74 | n.s. |
| Wensleydale ... | .40 | 4.71 | 5.11 | 4.83 |
| Mazoe— | | | | |
| Argyle Park ... | .19 | 1.91 | 2.10 | n.s. |
| Atherstone ... | .05 | 2.71 | 2.76 | 3.16 |
| Bellevue ... | .18 | 3.80 | 3.98 | n.s. |
| Bindura ... | ... | 2.66 | 2.66 | 3.47 |
| Ceres ... | .21 | 4.28 | 4.49 | 3.98 |
| Chipoli ... | .07 | 1.10 | 1.17 | 4.40 |
| Citrus Estate ... | .05 | 6.73 | 6.78 | 3.85 |
| Craigengower ... | .02 | 6.25 | 6.27 | 4.53 |
| Dandejena ... | .02 | 3.86 | 3.88 | n.s. |
| Donje ... | ... | 2.59 | 2.59 | n.s. |
| Frogmore ... | ... | 3.32 | 3.32 | 3.28 |
| Glen Divis ... | ... | 3.50 | 3.50 | 4.09 |
| Glen Grey ... | .04 | 3.84 | 3.88 | 2.79 |
| Great B ... | ... | 3.21 | 3.21 | 3.48 |
| Hinten ... | ... | 1.69 | 1.69 | n.s. |
| Horta ... | ... | ... | ... | n.s. |
| Kilmer ... | .02 | 5.74 | 5.76 | 3.98 |
| Kingston ... | ... | 3.56 | 3.56 | 4.89 |
| Maienza ... | ... | 3.32 | 3.32 | 3.72 |
| Mazoe Dam ... | ... | 3.59 | 3.59 | 4.15 |

## RAINFALL—(*Continued*).

| STATION. | | 1928. Oct. | Nov. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|---|
| **Zone D.—(Continued)** | | | | | |
| **Mazoe (continued)—** | | | | | |
| Mgutu | ... | ... | 2.49 | 2.49 | 4.58 |
| Muripfumba | ... | ... | 4.02 | 4.02 | 3.52 |
| Omeath | ... | .02 | 3.71 | 3.73 | 3.61 |
| Pearson Settlement | ... | ... | ... | ... | 4.13 |
| Riversdale Estate | ... | ... | 3.45 | 3.45 | n.s. |
| Ruia | ... | ... | 2.53 | 2.53 | 4.24 |
| Rustington | ... | ... | 2.04 | 2.04 | 2.69 |
| Shamva Mine | ... | .01 | 3.14 | 3.15 | 4.13 |
| Stanley Kop | ... | ... | 5.71 | 5.71 | 3.89 |
| Sunnyside | ... | .06 | 4.94 | 5.00 | 3.94 |
| Teign | ... | ... | 5.22 | 5.22 | 3.91 |
| Usk | ... | ... | 4.02 | 4.02 | 3.83 |
| Virginia | ... | ... | 5.07 | 5.07 | 3.37 |
| Visa | ... | ... | 3.51 | 3.51 | n.s. |
| Woodlands | ... | .17 | 4.38 | 4.55 | 4.00 |
| Zombi Farm | ... | ... | 3.11 | 3.11 | 3.89 |
| **Mrewa—** | | | | | |
| Maryland | ... | .10 | 4.51 | 4.61 | n.s. |
| Montclair | ... | .72 | 4.12 | 4.84 | n.s. |
| Mrewa | ... | ... | 1.72 | 1.72 | 5.18 |
| Nyaderi Mission | ... | .50 | 3.60 | 4.10 | n.s. |
| Selous Nek | ... | ... | 1.25 | 1.25 | 4.63 |
| **Mtoko—** | | | | | |
| Makaha | ... | 1.63 | 2.35 | 2.98 | 3.82 |
| Mtoko (N.C.) | ... | ... | 3.52 | ... | 3.94 |
| Rukore | ... | ... | ... | ... | n.s. |
| **Salisbury—** | | | | | |
| Arcturus | ... | 1.40 | 4.73 | 6.13 | 4.79 |
| Chindamora Reserve | ... | .23 | 4.06 | 4.29 | 4.77 |
| Datata | ... | .07 | 5.95 | 6.02 | n.s. |
| Glenara | ... | .18 | 2.23 | 2.41 | 4.93 |
| Goromonzi | ... | .20 | 5.69 | 5.89 | 4.84 |
| Hatcliffe | ... | .09 | 3.02 | 3.11 | 4.87 |
| Hillside (Bromley) | ... | ... | 4.93 | 4.93 | 4.49 |
| Kilmuir | ... | .18 | 5.12 | 5.30 | 4.56 |
| Meadows | ... | .25 | 3.91 | 4.16 | 4.97 |
| Pendennis | ... | .42 | 2.60 | 3.02 | n.s. |
| Selby | ... | ... | 3.55 | 3.55 | 4.86 |
| Springs | ... | ... | 5.45 | 5.45 | n.s. |
| Teviotdale | ... | .16 | 2.72 | 2.88 | n.s. |
| Vainona | ... | .15 | 2.68 | 2.83 | 5.13 |
| **ZONE E.:** | | | | | |
| **Belingwe—** | | | | | |
| Belingwe (N.C.) | ... | ... | .67 | .67 | 4.17 |
| Doro | ... | ... | 1.51 | ... | 2.32 |
| Shabani | ... | .01 | 1.44 | 1.45 | 2.03 |

## RAINFALL—(*Continued*).

| STATION. | 1928. Oct. | 1928. Nov. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE E.—(Continued) | | | | |
| Bikita— | | | | |
| Angus Ranch ... | ... | 1.93 | 1.93 | 2.56 |
| Bikita ... | .09 | 2.06 | 2.15 | 2.90 |
| Devuli Ranch ... | ... | .98 | .98 | 3.28 |
| Pamushana ... | .11 | 1.56 | 1.67 | 3.97 |
| Charter— | | | | |
| Buhera ... | ... | 3.43 | 3.43 | 4.66 |
| Chibi— | | | | |
| Chibi ... | .04 | .77 | .81 | 2.95 |
| Lundi ... | ... | ... | ... | 2.70 |
| Mpapas ... | ... | ... | ... | 2.05 |
| Chilimanzi— | | | | |
| Allanberry ... | ... | 2.65 | 2.65 | 4.60 |
| Driefontein ... | .01 | 1.90 | 1.91 | 4.30 |
| Felixburg ... | .. | 1.53 | 1.53 | 4.32 |
| Grootfontein ... | ... | 1.69 | 1.69 | 5.15 |
| Induna Farm ... | .02 | 2.95 | 2.97 | 4.90 |
| Mtao Forest ... | .10 | 1.87 | 1.97 | 4.12 |
| Mukowries ... | ... | 4.04 | 4.04 | n.s. |
| Thornhill ... | ... | 1.33 | 1.33 | n.s. |
| Gutu— | | | | |
| Alheit Mission ... | .28 | 3.13 | 3.41 | 3.87 |
| Divuli Store ... | ... | 5.02 | ... | n.s. |
| Eastdale Estate ... | ... | 2.32 | 2.32 | 4.57 |
| Gutu (N.C.) ... | ... | 3.02 | 3.02 | 4.29 |
| Glenary ... | ... | 1.90 | 1.90 | 4.11 |
| Gwelo— | | | | |
| Glencraig ... | .40 | 5.96 | 6.36 | n.s. |
| Partridge Farm ... | .48 | 3.14 | 3.62 | 5.35 |
| Sheep Run Farm ... | .22 | 2.57 | 2.79 | 4.78 |
| Inyanga— | | | | |
| St. Trias' Hill ... | ... | 5.68 | 5.68 | 5.85 |
| Insiza— | | | | |
| Roodeheuvel ... | ... | 2.07 | 2.07 | 2.92 |
| Stoneham (Brac Valley) ... | .09 | 2.51 | 2.60 | n.s. |
| Makoni— | | | | |
| Bude ... | .02 | 5.11 | 5.13 | n.s. |
| Chirumwe ... | ... | 3.70 | ... | n.s. |
| Craigendoran ... | .07 | 2.73 | 2.80 | 4.78 |
| Forest Hill ... | .08 | 6.07 | 6.15 | 6.43 |
| Gorubi Springs ... | .23 | 3.59 | 3.82 | 5.20 |
| Inyagura ... | .18 | 3.95 | 4.13 | n.s. |
| Mona ... | .27 | 10.01 | 10.28 | 6.08 |
| Monte Cassino ... | .24 | 5.51 | 5.75 | 5.77 |
| Ruati ... | .50 | 4.24 | 4.74 | n.s. |
| Rusape (N.C.) ... | ... | 4.67 | 4.67 | n.s. |
| Springs ... | .09 | 5.10 | 5.19 | 5.56 |
| Tablelands ... | .29 | 3.17 | 3.46 | 4.51 |
| Whitgift ... | .05 | 3.86 | 3.91 | n.s. |

## RAINFALL—*(Continued).*

| STATION. | | 1928. Oct. | 1928. Nov. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|---|
| ZONE E.—(Continued) | | | | | |
| Marandellas— | | | | | |
| Bonongwe | ... | .05 | 5.68 | 5.73 | 5.05 |
| Delta | ... | ... | 3.68 | 3.68 | 4.26 |
| Elandslaagte | .. | ... | 3.57 | 3.57 | 4.95 |
| Lushington | .. | ... | 4.59 | 4.59 | n.s. |
| Macheke | .. | .02 | 4.24 | 4.26 | 5.32 |
| Marandellas (N.C.) | ... | .06 | 4.69 | 4.75 | 5.14 |
| Marandellas Estate | ... | ... | 3.71 | 3.71 | 4.39 |
| Nelson | ... | ... | 4.05 | 4.05 | 4.32 |
| Wedza Reserve | ... | .05 | 4.16 | 4.21 | n.s. |
| Wenimbi | ... | | 3.60 | 3.60 | n.s. |
| Melsetter— | | | | | |
| Brackenbury | ... | ... | ... | ... | 6.21 |
| New Year's Gift | ... | ... | 2.37 | 2.37 | n.s. |
| Sabi Tanganda Estate | ... | ... | 2.39 | 2.39 | n.s. |
| Tom's Hope West | ... | .74 | 7.98 | 8.72 | n.s. |
| Ndanga— | | | | | |
| Bangala Ranch | ... | ... | ... | ... | n.s. |
| Doornfontein | ... | ... | 4.81 | 4.81 | 3.80 |
| Marah Ranch | ... | ... | 1.02 | ... | 3.55 |
| Triangle Ranch | ... | ... | 2.43 | ... | 2.23 |
| Zaka | ... | ... | 4.70 | 4.70 | n.s. |
| Selukwe— | | | | | |
| Aberfoyle Ranch | ... | .25 | 1.64 | 1.89 | 3.30 |
| Hillingdon | ... | .23 | 2.25 | 2.48 | 3.76 |
| Impali Source | ... | .22 | 1.11 | 1.33 | 3.29 |
| Rio | ... | ... | 1.57 | 1.57 | 3.77 |
| Safago | ... | .34 | 3.09 | 3.43 | 4.11 |
| Selukwe | ... | .35 | 1.71 | 2.06 | 4.29 |
| Umtali— | | | | | |
| Argyle | ... | ... | 4.91 | 4.91 | 4.59 |
| Embeza | ... | .17 | 6.56 | 6.73 | n.s. |
| Fairview | ... | ... | 4.46 | 4.46 | n.s. |
| Fern Valley | ... | .02 | 3.78 | 3.80 | 3.95 |
| Jerain | ... | .34 | 2.88 | 3.22 | 4.14 |
| Mutambara Mission | ... | .09 | 1.95 | 2.04 | 4.37 |
| Odzani Power Station | ... | .04 | 5.27 | 5.31 | 5.17 |
| Park Farm | ... | .04 | 4.43 | 4.47 | 3.47 |
| Premier Estate | ... | ... | 4.48 | 4.48 | 3.87 |
| Sarum | ... | .02 | 3.23 | 3.25 | 3.76 |
| Sheba | ... | .23 | 4.35 | 4.58 | n.s. |
| Stapleford | ... | ... | 6.96 | ... | 8.12 |
| St. Augustine's Mission | ... | .05 | 6.16 | 6.21 | 5.13 |
| Transsau Estate | ... | ... | 3.18 | 3.18 | 3.79 |
| Umtali Gaol | ... | ... | 4.00 | 4.00 | 4.83 |
| Victoria— | | | | | |
| Bruceham e | ... | ... | 1.48 | 1.48 | 3.35 |
| Cambria | ... | ... | 2.58 | 2.58 | 3.52 |
| Cheveden | ... | .01 | 2.32 | 2.33 | 3.43 |
| Clipsham | ... | .18 | 1.49 | 1.67 | 3.78 |

## RAINFALL—*(Continued).*

| Station. | 1928. Oct. | 1928. Nov. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| Zone E.—(Continued) | | | | |
| Victoria (continued)— | | | | |
| Gokomere ... | ... | 1.19 | 1.19 | 4.25 |
| Kimberley Ranch ... | ... | ... | ... | n.s. |
| Mashaba ... | .. | 1.71 | 1.71 | 4.44 |
| Miltonia ... | ... | .82 | .82 | n.s. |
| Riverdene North ... | .05 | 2.08 | 2.13 | 3.96 |
| Salemore ... | ... | ... | ... | 2.76 |
| Silver Oaks .. | .01 | ... | ... | 3.68 |
| Stanmore ... | ... | 1.37 | 1.37 | 3.94 |
| Victoria ... | ... | 1.67 | 1.67 | 4.02 |
| Zimbabwe . | .20 | .71 | .91 | 3.54 |
| Zone F.: | | | | |
| Melsetter— | | | | |
| Chikore ... | .02 | .95 | .97 | 4.67 |
| Chipinga . | .08 | 1.63 | 1.71 | 5.56 |
| Lettie Swan . | .21 | 2.49 | 2.70 | n.s. |
| Melsetter .. | ... | 3.42 | 3.42 | 6.39 |
| Mount Selinda ... | .17 | 1.64 | 1.81 | 6.84 |
| Vermont ... | .19 | 5.52 | 5.71 | 7.50 |
| Umtali— | | | | |
| Chimeze ... | ... | ... | ... | 7.21 |
| Cloudlands ... | ... | 6.63 | ... | n.s. |

# Export of Cattle from Southern Rhodesia, 1928.

| Month | Union | | England. | Congo | | N. Rhodesia | Portuguese East Africa. | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Slaughter | | Slaughter | | | | | | | |
| | Johannesburg | I.C.S. for overseas | On hoof | Slaughter | Breeding | Breeding | Slaughter | Trek | Breeding | |
| January ... | 55 | | .. | 1,370 | 39 | ... | 108 | ... | ... | 1,572 |
| February . | 190 | ... | ... | 2,287 | 453 | ... | 111 | ... | ... | 3,041 |
| March ... | 562 | 2,746 | ... | 4,257 | 13 | 192 | 39 | ... | ... | 7,809 |
| April ... | 957 | 4,927 | ... | 3,468 | 12 | 193 | 84 | ... | ... | 9,641 |
| May ... | 1,522 | 5,864 | . | 4,545 | 11 | .. | 36 | ... | 5 | 11,983 |
| June ... | 2,278 | 6,000 | ... | 1,505 | 949 | ... | 177 | ... | 5 | 10,914 |
| July ... | 1,370 | 2,066 | 140 | 1,458 | 1,682 | 10 | 104 | 33 | ... | 6,863 |
| August ... | 1,400 | 4,949 | ... | 1,372 | 2,352 | ... | ... | 32 | ... | 10,105 |
| September ... | 879 | 571 | ... | 2,076 | 147 | 4 | 32 | ... | ... | 3,709 |
| October ... | 775 | .. | ... | 1,478 | 43 | .. | 38 | 14 | 22 | 2,370 |
| November ... | 334 | ... | ... | 1,096 | ... | ... | ... | ... | .. | 1,430 |
| December ... | | | | | | | | | | |

J. M. SINCLAIR,

Chief Veterinary Surgeon.

## Dates of Meetings of Farmers' Associations, Southern Rhodesia.

| Name of Association. | Place of Meeting. | Secretary. | Jan. | Feb. |
|---|---|---|---|---|
| | | | 1929 | 1929 |
| Ayrshire—Sipolilo | Various farms | G. H. Cautherley | 12 | ... |
| Banket Junction | Banket Hotel | A. M. Hutchinson | 4 | 1 |
| Beatrice District | Farmers' Hall, Beatrice | W. Krienke | 31 | 28 |
| Bindura | Bindura Farmers' Hall | W. E. Fricker | 11 | 8 |
| Bromley | Farmers' Hall, Bromley Siding | E. Somerville-Collie | 2 | 6 |
| Bubi | Queen's Mine | C. H. Olsen | 8 | 12 |
| Bulawayo Landowners' and Farmers' Association | Library Buildings, Bulawayo | W. A. Carnegie | 10 | 14 |
| Chakari | Balwearie (Jan.), Handley Cross (Feb.) | L. T. Tracey | 16 | 20 |
| Daisyfield | Somabula (Jan.), Daisyfield (Feb.) | L. E. Edwards | 12 | 16 |
| Darwendale—Trelawney | Various farms | Charles H. Tanner | 23 | 27 |
| Eastern Districts | Farmers' Hall, Chidza | W. E. Richards | 12 | 9 |
| Enkeldoorn | Enkeldoorn | C. N. Ludlowe | 1 | 5 |
| Enterprise | Farmers' Hall | James Watson | 1 | 5 |
| Essexvale | Essexvale | Col. D. Judson | 20 | 17 |
| Felixburg—Gutu | Glenary (Jan.), Fairburn (Feb.) | A. J. Bradshaw | 12 | 9 |
| Figtree Branch, R.L. and F.A. | Figtree Hotel | The Secretary | 1 | 5 |
| Gadzema | Gadzema | M. G. Leahy | 11 | 8 |
| Gatooma | Speck's Hotel | J. A. Smith | 19 | 16 |
| Gatooma (Golden Valley Branch) | Golden Valley Hotel | C. A. K. Beaton | 12 | 9 |
| Gazaland (South Melsetter) | Chipinga Hotel | Mrs. C. N. Reading | 7 | 4 |
| Greystone | Quarrie Farm | P. J. van der Walt | 12 | ... |
| Gwanda | Lowenthal's Building, Gwanda | N. J. B. Nilson | 19 | 16 |
| Hartley | Old Schoolroom, Hartley | E. Etheredge | 26 | 23 |
| Headlands | Headlands | J. A. Eve | ... | ... |
| Hunter's Road | Hunter's Road | R. W. Twilley | 26 | 23 |
| Insiza South | Farm Lancaster | J. Campbell | 10 | 14 |
| Inyazura | Inyazura | W. P. Frudd | ... | 1 |
| Lalapansi | Lalapansi | Edmund Chapman | 12 | 9 |
| Lomagundi | Sinoia | F. W. Robertson | ... | ... |
| Lomagundi West | Various farms | A. A. Bisset | 13 | 10 |
| Macheke | Farmers' Hall, Macheke | The Secretary | ... | ... |

| | | | | |
|---|---|---|---|---|
| Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association | Various Farms | T. R. Colam | 5 | 2 |
| Makwiro | Makwiro | F. H. Howard | 18 | 15 |
| Marandellas | Marandellas Farmers' Hall | E. Cruikshank | 4 | 1 |
| Marandellas, Southern | Various farms | D. L. Gale | 2 | 6 |
| Mashonaland | Mashonaland Farmers' Hall, Salisbury | C. Lamb | 11 | 8 |
| Matobo South | Farmers' Hall, Malundi Farm | A. G. Allen | .. | 16 |
| Matopo Branch, R.L. and F.A. | Farmers' Hall, Malundi | W. Mirtle | 19 | 16 |
| Mazoe (Concession) | Concession Hotel | Frank Allen | 11 | 8 |
| Mazoe (Glendale) | Farmers' Hall, Glendale | ——— | 9 | 13 |
| Melsetter | Court House, Melsetter | Dr. Rose | 10 | 14 |
| Midlands Farmers and Stockowners | Royal Hotel, Gwelo | T. R. van Rooyen | 9 | 13 |
| Ngezi-Umniati | Harvieston, Enkeldoorn | Miss Harvie | 26 | 23 |
| North Umniati | ——— | J. F. Eagar | Not | received |
| Norton and Lydiate District | Norton | R. D. Palmer | 4 | 1 |
| Nyamandhlovu | Nyamandhlovu | R. D. McLean | .. | ... |
| Odzi District Farmers | Odzi Hotel | F. H. Burnett | 5 | 2 |
| Poorte Valley | Various places | A. D. Wilson | 19 | 16 |
| Que Que | Offices of the Que Que Sanitary Board | J. Hogg | 19 | 16 |
| Rusape Farmers' Association | Rusape | R. Munch | 5 | 2 |
| Salisbury South | Various farms | P. Linton | 30 | 27 |
| Selukwe | The Hotel, Selukwe | W. T. Simpson | ... | ... |
| Shamva | Shamva Hotel | W. Stanley-Stollard | 17 | 21 |
| Two Rivers Farming Association | Various farms | W. L. Parsons | 19 | 16 |
| Umboe (Branch of Lomagundi F.A.) | Long Valley (Feb.) | C. W. S. Ford | ... | 9 |
| Umvukwe Farmers' and Tobacco Growers' Association | Various ranches | E. Wrightson | 12 | 9 |
| Umtali | Drill Hall, Umtali | A. Howat | 3 | 7 |
| Umvuma and District | Umvuma | H. B. Colling | Not | received |
| Victoria | Victoria | G. E. Lamb | 5 | 2 |
| Wankie District | ——— | W. Brownlee Cumming | Not | received |
| Western | Plumtree Hotel | The Secretary | 12 | 9 |
| Willoughbys | Willoughbys | A. E. Roberts | Not | received |

# Rhodesian Milk Records.

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| Freesia ... | Grade Friesland | 3,840.25 | ... | 150 | C. E. Strickland, Shamva |
| Mona ... | do | 3,424.00 | ... | 180 | do do |
| Poppy ... | do | 2,966.00 | ... | 150 | do do |
| Julia ... | do | 2,091.50 | ... | 150 | do do |
| Kitty ... | do | 2,479.00 | ... | 120 | do do |
| Kate ... | Grade Shorthorn | 4,102.50 | ... | 210 | do do |
| Geranium ... | do | 1,878.50 | ... | 90 | do do |
| Joyce ... | Grade Friesland | 3,468.50 | ... | 90 | W. F. Scott, Norton |
| Bertha ... | do | 2,859.00 | ... | 90 | do do |
| Noreen ... | do | 2,778 50 | ... | 90 | do do |
| Sybil ... | do | 2,701.00 | ... | 90 | do do |
| Dorothy ... | do | 2,348.50 | ... | 90 | do do |
| Beryl ... | do | 2,527 00 | ... | 90 | do do |
| Frances ... | do | 3.138.50 | ... | 90 | do do |
| Wolseley Josephine II. | Friesland | 8,269.75 | 282.41 | 270 | W. R. Waller, Salisbury |
| Bluff Hill Flora | do | 10,579.00 | 351.64 | 300 | do do |
| Dunoran Pearl | do | 10,224.25 | 348.52 | 270 | do do |
| De Grendel Sophie | do | 9,662.00 | 313.77 | 270 | do do |
| De Grendel Robelina | do | 6,948.75 | 229.59 | 180 | do do |
| Bluff Hill Faith | do | 6,626 00 | 229.30 | 270 | do do |
| Bluff Hill Floss | do | 5,869.50 | 191.84 | 210 | do do |
| Bluff Hill Fan... | do | 1,609.50 | 49.84 | 60 | do do |
| Bluff Hill Fancy | do | 2,161.25 | 68.17 | 90 | do do |
| Bluff Hill Fiona | do | 2,079.00 | 64.46 | 90 | do do |
| Bluff Hill Fluff | do | 735.75 | 22.05 | 30 | do do |
| Bluff Hill Fairy | do | 815.50 | 24.45 | 30 | do do |
| Harlen's Quest | do | 7,262.75 | 235.99 | 210 | do do |
| Harlen's Query | do | 4,480.25 | 140.81 | 120 | do do |
| Harlen's Dainty | do | 4.591.00 | 149.42 | 120 | do do |
| Harlen's Primrose | do | 2,058.00 | 64.88 | 60 | do do |
| Harlen's Model | do | 1,074.75 | 33.29 | 30 | do do |
| Marie of Bitton | do | 919.50 | 30.32 | 30 | do do |
| De Grendel de Hoop | do | 11,092.50 | 353.53 | 292 | Gwebi Experiment Farm |
| De Grendel Roza | do | 6,679.75 | 160.84 | 260 | do. do |
| De Grendel Froukje | do | 11,182.25 | 299.02 | 276 | do do |
| De Grendel Selma | do | 9,969.75 | 279.77 | 238 | do do |
| De Grendel Laura | do | 5,650.75 | 167 44 | 203 | do do |

## RHODESIAN MILK RECORDS (continued).

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| De Grendel Bessie Burger | Friesland | 2,243.75 | 66.13 | 46 | Gwebi Experiment Farm |
| Wit Fancy ... | do | 7,859 50 | 239.19 | 324 | do do |
| Mimosa Pel Steinser | do | 7,280.25 | 252.70 | 300 | do do |
| Mimosa Pel Clara II. | do | 8,078.75 | 260.07 | 245 | do do |
| Mimosa Clara X. | do | 9,272.00 | 256.03 | 147 | do do |
| Melrose Corrie... | do | 7,773.75 | 303 73 | 185 | do do |
| Melrose Roosje | do | 4,841.25 | 124.00 | 121 | do do |
| Melrose Maandag | do | 3,186.25 | 117.06 | 70 | do do |
| Madge of Batavia | do | 596.50 | 17.59 | 21 | do do |
| Gwebi Laura ... | do | 3,326.50 | 87.25 | 91 | do do |
| Allie ... | do | 3,279.25 | 95.29 | 70 | do do |
| Fanny ... | Grade Friesland | 10,940 25 | 352.09 | 346 | do do |
| Kleinbloem ... | do | 7,706.50 | 234.71 | 267 | do do |
| Hannah ... | do | 11,180.50 | 355.40 | 261 | do do |
| Gladys ... | do | 6,389.50 | 193.11 | 140 | do do |
| Roodebloem ... | do | 1,932.00 | 50.80 | 77 | do do |
| Waterbloem ... | do | 3,334.75 | 88.51 | 67 | do do |
| Isa ... | do | 1,922.00 | 61.55 | 36 | do do |
| Gwebi Elsie ... | do | 4,926.75 | 154.10 | 102 | do do |

# Farming Calendar.

## January

### BEE-KEEPING.

This month is a slack one for actual hive work. Each hive should continue to be carefully watched to see that any attempt by the wax moth to gain a footing is at once stopped. In the great heat of this month, see that proper ventilation is supplied, as well as enough water. Precautions against the depredations of white and other ants should also be watched daily. Where possible, examine now and again the brood chamber for queen cells, and destroy them if not wanted. Requeening can be done where desired on the uniting system, if the apiarist does not know of the better plan of rearing his own queens. In the workshop have a spare hive or two complete and ready for occupation, well painted, for any new swarms that may be required in the coming months. Though the second honey flow of the season is not due to start until about March or April, there should be ample stores coming in meanwhile to keep all bees busy in breeding, nursing, and bringing the hive generally to full strength for the winter, as well as for their own daily food supplies. There will not be enough honey coming in now for surplus purposes, therefore see that the supers are not left on the hives to a greater degree than to give the inmates plenty of room to loaf in.

### CITRUS FRUITS.

The planting of citrus trees should be completed if possible by the end of the month, for trees planted later may not harden up before the winter; they then become susceptible to winter injury from cold.

This month is the best one for planting shelter belts to protect all varieties of fruit trees from the prevailing dry winds.

Cover or green crops may be planted during this month; if the grove has been over-run with grass or weeds, sow the cover crop seed more thickly. This will assist in smothering future weed growth.

Continue suppressing any undesirable shoots that may develop on the tree trunk or other parts of the tree.

Drain any depressions that allow rain or irrigation water to accumulate at the base of the trees, for trees permitted to stand in water will speedily fall victims to disease or pest injury.

### DECIDUOUS FRUITS.

Continue planting cover or green crops between the trees. These crops may then be turned under towards the end of the rainy season to furnish the necessary humus.

Summer pruning may be continued. Rub or break out any undesirable shoots that have a tendency to crowd each other; suppress all growths on the main stem from the ground level up to the main arms of the tree, for these are unnecessary. If next year's fruit crop is to be of good size and quality, the inner fruiting wood of a tree must receive

sufficient air and light to mature fully. If the new growth is too dense it will prevent the fruiting wood from maturing, and poor crops will be the result. The thinning out of the summer growth will overcome this crowding and weakening of the fruiting wood.

Many fruits will be ripening during the month. Do not permit the fruit to become over-ripe on the trees; rather harvest it at the correct stage and store or sell the surplus.

Plant shelter trees if the orchard is exposed to the prevailing winds, as good crops of fruit cannot be expected from inadequately protected fruit trees.

## CROPS.

If not already sown, put in the ensilage and fodder crops at once, such as maize and legumes, oats and other hay grass crops.

Sow short season crops like haricot beans, linseed, buckwheat, peas, summer oats, gram and mung bean.

Plant out grasses and kudzu vine for pasture.

Ridge potatoes and cultivate thoroughly. Main crop can still be planted.

Quick growing green manuring crops, such as cowpeas, soya beans and sunn hemp, may still be sown this month.

Earth up ground nuts so that a small amount of loose soil is thrown over the crowns of the plants. This assists the formation of nuts.

If not already done and where practised, legumes or long season oats such as Algerian can be sown under the maize crop for grazing and to add nitrogen and humus to the soil.

Cultivate all growing crops well, and thoroughly eradicate weeds.

Overhaul all hay-making implements and ploughs and get in thorough repair in preparation for the haying and ploughing seasons.

Endeavour to mow grass fields early for hay and litter, and to obtain second cutting for hay in April.

Fallowed lands or fields not yet planted may be disc-harrowed or ploughed to prevent weeds from seeding.

Mow grass paddocks infested with annual weeds to prevent the weeds seeding.

Prevent Mexican marigold and other noxious weeds seeding by hoeing or pulling out the plants by hand.

Keep a sharp look-out for maize stalk borer. Cut off the tops of infested plants or treat them with a recognised chemical preparation. If topping is practised, remove tops from land, and bury, burn or feed them at once to farm stock.

Watch the maize lands for witch weed. Prevent witch weed plants from seeding by cultivation and by hand-pulling the plants.

Make as much manure as possible by placing grass and litter in cattle kraals, pig sties and stables.

If there is stumping and clearing to be done, push on with it. Endeavour to get as much of the new virgin land as possible broken up during this and the two following months.

## DAIRYING.

During the months of December and January veld grazing is usually plentiful, and very little extra feed in the form of concentrates is required for dairy stock. It should be borne in mind, however, that heavy milking cows are unable to satisfy their requirements for milk production from veld grazing alone, and should receive a daily allowance of grain; the latter should be fed at the rate of 2 lbs. for every gallon of milk produced daily,

i.e., a cow producing three gallons of milk should receive 6 to 7 lbs. of concentrates. An excellent mixture for this purpose is one consisting of four parts maize meal and one part ground-nut cake.

During wet weather, the provision of a clean dry shelter for calves is essential; the latter should not be crowded together in a small, damp, badly ventilated pen or muddy kraal. When treated in this manner, a calf is very liable to contract various ailments such as scour, etc. Scour is entirely preventable, and is usually caused by over feeding, or feeding from dirty pails, feed boxes, etc. Calves which contract scour should be isolated, the milk ration reduced, and they should be dosed with a few tablespoonfuls of castor oil.

Under the weather conditions which now obtain, cream should be despatched to the creamery at least three times a week. It is of the greatest importance that cream should be cooled immediately after separation, and should be kept cool while on the farm and whilst in transit to the railway station or siding. While the cream is being cooled, it should be frequently stirred, using a stirrer with a plunger attachment. Warm, freshly separated cream should not be mixed with old cream which has already been cooled. Cool the fresh cream first and then mix thoroughly with the old cream. Gassiness is a common defect in the cream received at the creameries at this time of the year, and is caused by gas-producing organisms with which the milk and cream are contaminated. These organisms abound in mud, manure, etc., and develop and multiply very rapidly at high temperatures. Any precautions therefore which may be taken to eliminate dirt, manure, etc., from the milk and to keep the cream cool will prevent the development of gassiness.

As the night temperatures are fairly high, cheese-makers should not attempt to use night's milk for cheese-making; morning's milk plus a starter will give the best results. Gouda cheese-making operations are not usually successful at this season of the year, owing to the poor quality of the milk and the prevalence of gassiness. This type of cheese is best manufactured during March and subsequent months.

## ENTOMOLOGICAL.

Maize.—Late planted crops are subject to attack by snout beetles, grasshoppers and crickets. Poisoned bait is a useful remedy. Write for particulars. Plants infested with stalk borer may be cut out, removed from the land and destroyed. Crops planted after the new year are frequently attacked very heavily by stalk borers of the second brood (February to March) and are commonly of little value, except for ensilage. If the lands are allowed to become weedy, especially with grasses, during this month, loss may occur from leaf-eating caterpillars when the lands are cultivated. Danger from the army worm is also greater in weedy than in clean lands.

Tobacco.—Most pests of this crop may be active during January, e.g., wireworms, surface beetles, crickets, grasshoppers, stem borer, leaf miner, etc. Consult article on tobacco pests in "Rhodesia Agricultural Journal," January, 1928.

Potato.—This crop may be sprayed with arsenate of lead (powder) 1 lb. in 25 gallons of water if attacked by leaf-eating ladybirds, blister beetles or other leaf-eating insects. This poison may be combined with Bordeaux mixture when spraying against early blight.

Kitchen Garden.—Marrow and cucumber plants about to set fruit may be sprinkled regularly with the following formula to destroy fruit flies which "sting" fruit:—Arsenate of lead (powder) 1½ ozs., molasses ½ gallon or cheapest sugar 2½ lbs., water 4 gallons. To destroy leaf-eating insects generally dust plants with arsenate of lead (powder) 1 part in 20 parts of finely ground maize meal or finely sifted slaked lime. Aphides (plant lice) may be treated with soap 1 lb. in 5 gallons of water, or tobacco

wash, or simply by regular spraying with a forceful stream of cold water from a spray pump.

Fruit Trees.—Deciduous fruits are subject to attack by large beetles, which should be destroyed by jarring into a net and dropping thence into a tin containing water with a film of paraffin oil on the surface. Trees should be covered in mosquito netting to protect the fruit from fruit-piercing moths. The large adult beetles of the fig borer may be seen on the young shoots and should be destroyed. Borers in the trunks of the trees may be killed by injecting a little carbon bisulphide.

Mosquitoes, House Flies, etc.—Screen windows and doors. Destroy breeding places around homestead. House flies may be poisoned cheaply with sweetened arsenite of soda solution. Write for directions.

**When in doubt as to the identity of any pest or the method of dealing with it, apply promptly to the Chief Entomologist, Salisbury, bringing or sending specimens of the insects concerned. Note, however, that it is sometimes feasible to prevent injury from pests for which no practical remedy is known. Farmers should therefore endeavour to obtain some knowledge of the pests of the crops they are growing through the articles published in this Journal.**

## FLOWER GARDEN.

This month requires all one's energy in the flower garden. Annuals may still be sown for late flowering before the season is over. Planting out should be done as early as the weather permits, and advantage taken of a dull day after a shower for this work. If care be exercised much smaller plants may be put out than would at first be thought advisable, as with attention these will make stronger plants than larger ones, which are more likely to receive a check. The soil requires constant stirring, owing to the packing caused by the rains and for the eradication of weeds, which are now very troublesome. All plants should be kept free of dead and decaying matter.

## VEGETABLE GARDEN.

Turnips, carrots, cabbages, lettuce, etc., may be sown for carrying on during the winter months. Potatoes may be planted this month for keeping through the winter. Weeding and cultivating between the rows should be continually carried on.

## FORESTRY.

If the rains are seasonable, plant out evergreen trees, such as gums, cypress, pines, etc. Fill in all blanks as soon as they are noticed, and do not leave them until the following season. Planting should be done on a wet day, or, failing that, on a dull day, or late in the afternoon. Great care should be taken to see that the trees are not planted out any deeper than they stood in the tins.

## POULTRY.

The continuance of the long spell of hot, dry weather has been finding out the weak spots in the constitution of many birds. Naturally those that are strong and vigorous come through it well and do their duty; the weaker ones stop laying. To a large extent, however, the remedy is in the hands of the poultry breeder. If he treats the birds properly, *i.e.*, makes them take plenty of scratching exercise, lessens the amount of heating and fattening food given and increases the amount of cooling foods, *e.g.*, green food, thick milk, etc., his birds will come through the hot, dry weather well, and also lay well. However, the hot, dry period should nearly be at an end now, and the poultry keeper has to take precautions whereby the wet weather will not affect his birds' health and their laying powers. All houses must be absolutely watertight, the floor

raised well above the level of the surrounding ground, thus preventing water seeping in and making it damp. The birds themselves should not get wet, and no pools of water should be seen in the runs.

Foodstuffs must be kept absolutely dry, otherwise they will become mouldy and sour, causing disturbance of the intestinal tract, illness, and perhaps death; certainly a diminution in the number of eggs.

Some of the birds will now be in moult. To get them through it quickly give more sunflower seed, some monkey nuts, plenty of green food, especially cabbage, kale, etc., plenty of milk or some meat, a little sulphur in the dry mash (one teaspoonful to 1 lb.); also stew two dessert spoonfuls of linseed in a pint of water to a jelly, mix this to a crumbly consistency with mealie meal or bran, and give about one dessert spoonful to each bird daily. Get the birds through the moult as quickly as possible. Keep the birds dry during the rains, otherwise the egg output will decrease.

Do not hatch any more turkeys till after the rainy season is over. Any birds other than turkeys destined for the Christmas markets should be penned up in crates for a fortnight before killing and fed well. Turkeys should not be penned up, but allowed on free range; those for the Christmas market should be given more food.

Those who go in for ducks should feed well and get as many to marketable size as possible by Christmas, when they usually fetch good prices. They must be treated in almost exactly the reverse manner to what turkeys are. They should be kept in a small run; nearly all their food should be wet mash, bran, pollard, mealie meal, meat meal and milk, as much as they will eat three times a day, *i.e.*, they should practically be allowed to spend their existence eating and sleeping. Big duck breeders often give a fourth meal by lamplight at 10 p.m., and the first meal is given at sunrise.

## STOCK.

Cattle.—The recommendations for December apply equally to this month. Bulls should be returned to the herd during the month if a September or October calving season is desired.

Sheep.—Continue as recommended for December. If heavy rains are experienced a daily ration of a quarter of a pound of maize per ewe will keep them in condition, and will often prevent much trouble arising from poverty and anæmia. Those who favour autumn lambs must put the ram again with the flock in February, and should therefore now take steps (if necessary) by supplying a little extra feed as above recommended to fit the ewes for mating. A little forethought of this kind will tend to increase the stamina of the lambs and to bring the ewes in season more or less together, so that a protracted lambing season is avoided.

## TOBACCO.

Cultivation should be systematically continued, and no foreign vegetation allowed in the tobacco field, as weeds and grass induce insect attacks. All backward plants should be given special attention, and an additional application of fertiliser to hasten growth, so that the plants ripen as uniformly as possible. Curing barns should be placed in proper condition on rainy days, and all tobacco appliances should be placed in proper order for the rush of work during the curing season. Early planted tobacco may be ready for topping during the latter part of the month, and the common mistake of topping too high should be avoided. Go over the field carefully and select typical, uniform and disease-free plants for producing seed for next season's crop. All plants should be properly primed at the same time that the tobacco is topped.

## VETERINARY.

Horse sickness may now be expected, especially in districts where early heavy rains have occurred. Blue tongue in sheep will also be prevalent.

### WEATHER.

**Heavy rain is to be looked for, and during this month we may normally expect nine to twelve inches on the eastern border, eight in the north, and seven to seven and a half as one travels westwards or southwards. At this time of the year the rainfall tends to be heavier in the eastern than in the western portions of the Territory, whilst prolonged steady rains take the place of the thunder showers which marked the earlier part of the wet season. The growing period is at its height, and high temperatures are registered.**

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# February.

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### BEE-KEEPING.

In most parts of the two Rhodesias this month is one of fair activity for all bees, there being as a rule quite enough nectar, pollen, etc., available for all ordinary purposes of rearing, building cells, etc., and working generally for the due upkeep of the colony for the present as well as for the coming winter. Whether there will be any surplus honey for them to store will depend upon what crops the farmer may have on hand at this time, as the usual flora of the land will not supply it until the regular second flow of the year is due, which should be in March to April, according to the season.

Watch carefully for robbers, though, with well attended hives and due care in handling, there should be little to fear in this direction; strong, well filled hives can always repel robbers, which are only successful with weak colonies, and these no apiarist should ever have under his care. Mark well last month's advice, i.e., to have everything in readiness for dealing with unexpected new swarms that may be required as they may come, for nothing is more disconcerting or annoying than to be unready when the time arrives. This applies especially to any swarms that may come from the apiary, for a few days only of neglect of such a hive may easily lead to the moth taking early possession of the combs, and in practically a few hours destroy fully drawn-out combs that would otherwise be of much value for after working upon. Such combs, as they are available, should at once be packed away in an air- and moth-tight box or tin for after usage.

### CITRUS FRUITS.

**Newly-planted citrus trees should be kept free of weed growth likely to exclude necessary air and light for their normal and healthy development.**

**Citrus trees planted in February seldom give satisfactory results; late planted trees do not mature their new growths before winter, and they are more susceptible to winter injury or the ravages of disease or insect pests.**

**The early planted cover crops will be fit to plough under by the end of the month. Do not delay this operation for fear of the rains ending abruptly. If this occurs, great difficulties will be experienced when attempting to plough in the green crops.**

**Keep all young shelter belt trees free of weed growth, and loosen the soil round their stems fairly frequently to eliminate possible ant injury.**

**This is one of the best months for budding citrus trees, either in the nursery or grove—trees that are to be top worked to profitable varieties.**

**Late out-of-season fruit that may have set during December-January should be stripped from the trees. This fruit is valueless for export, and if allowed to mature, will affect the main crop setting of fruit.**

## CROPS.

Cultivate, and keep on cultivating as weather permits, to destroy weeds.

Continue to look out for stalk borer, and, if infection is discovered, deal with infested plants as advised in January notes.

Watch witch weed and continue cultivating and hand pulling it. Plough under witch weed, smother and trap crops.

Where practised, maize can be under-planted with sweet potato vines after the last cultivation for the following season's requirements.

Potatoes and ground nuts will probably need to be ridged again.

Catch crops of quick maturing beans, such as tepary bean, also buckwheat, can still be sown.

Keep down all noxious weeds. This work can be undertaken on wet days.

Make veld grass hay whenever a few days of fine weather permit. Early mowings provide the best hay.

Seed beds of onions for early winter planting can be sown towards the end of the month.

Keep potatoes in a cool shed, well ventilated.

Pick over any potatoes in storage and remove bad ones.

Continue to make as much farm manure as possible.

Begin to ride manure and place in heaps handy to the lands to be manured.

## DAIRYING.

This is normally the flush season as far as dairy produce is concerned; dairy cattle are usually in good condition and cows of average capacity should be able to subsist and maintain a full flow of milk on veld grazing alone. Calves may be given a few hours' exercise on bright, sunny days; young stock, however, should not be allowed to run and graze with the herd, and are best kept in a cool, airy pen opening on to a small shady paddock, where they can obtain a little exercise.

A good quality of sweet hay and water should always be available for young calves.

Cream deteriorates very rapidly under the conditions which obtain at this time of the year, so that every precaution should be taken to keep the cream as cool as possible pending despatch to the creamery. As there is a greater strain than usual on the separator during the flush months, frequent oiling is necessary, and care should be taken that the machine is mounted on a level foundation. The separator and all other dairy utensils must be cleaned immediately after use. First rinse the utensils with cool or lukewarm water, then wash thoroughly with boiling hot water, washing soda and a scrubbing brush; scald finally with boiling water.

The cheese in the storeroom is apt to develop mould during wet weather. If the cheese is well made and pressed and has a smooth rind, this mould is merely superficial and will not penetrate into the body of the cheese. Rubbing the cheese with a cloth moistened with a weak solution of formalin or permanganate of potash usually checks the development of mould. During these months care must be taken not to use over-acid milk for cheesemaking, and great care should also be taken of the starter. If this latter shows any signs of gasiness or develops any disagreeab.e flavour or odour it should be discarded and replaced by a fresh, clean starter. The cheese storeroom must be kept dark and flies excluded.

## DECIDUOUS FRUITS.

When sufficiently mature, plough under cover crops. This should be possible towards the end of the month.

Summer pruning should be completed early in the month; little or no advantage will be derived from trees treated when the new wood reaches maturity.

Do not allow fruit to become over-ripe, then expect remunerative prices for it. If it is harvested at the correct stage, then well graded and neatly packed, good prices may be expected for the surplus fruit sold.

This is a good month for budding deciduous fruit trees.

## ENTOMOLOGICAL.

Maize.—The first brood of the stalk borer matures this month, and the young of the second brood may be found amongst the younger leaves. Weeds should be kept down.

Tobacco.—Stem borer, leaf miner and budworms are the chief pests likely to be troublesome. Plants in the field found infested with the first two insects should be heavily pruned or destroyed. The budworm caterpillars can usually be hand picked during the process of topping. (See "Rhodesia Agricultural Journal," December, 1927.)

Potato.—Ladybirds and tuber moth may call for attention. The latter, when very bad, sometimes causes considerable wilting of the crop besides attacking tubers. The ladybirds may be destroyed by spraying with arsenate of lead 1 lb. to 16 gallons of water.

Cabbage Family.—All members of the family are liable to be attacked by the sawfly and webworm. The sawfly may be effectively controlled by dusting during a dry spell with Paris green and slaked lime (1 lb. Paris green and 20 lbs. slaked lime).

Melon Family.—The most important pest is the melon fly, which "stings" the fruit of all species of gourds. Destroy all badly "stung" fruit and spray remainder thoroughly with arsenate of lead (2 ozs. in 4 gallons of water) to which 2½ lbs. of cheap sugar has been added.

Deciduous Fruit.—Apples, pears and late peaches suffer chiefly from fruit moths, which puncture the fruit. No remedy available except covering the trees with netting.

Fig.—The fruit is liable to the attack of the fig weevil. All infested fruit and all wild fruit should be collected and destroyed. The borer in the stem may be killed by inserting a little carbon bisulphide into the burrow and sealing it up.

Poison Baiting.—Poison baiting against surface beetles, cutworms, etc.: No really effective bait has yet been discovered for cutworms, but the following poisoned bait is recommended for surface beetles, etc.: Paris green 1 lb., 180 lbs. maize meal. Mix thoroughly in dry state and add water until the material is of the consistency of a dough. Roll into small balls and place under shade. Spread in the evening.

## FLOWER GARDEN.

Sow carnations, phlox, pansy, verbena, gilias, larkspur, dianthus and pentstemon. The flower garden should be now looking its best, nearly all plants being in bloom. Old and dead flowers should be constantly removed, except when the seed is required. Seeding of the plants shortens their flowering period. All runners and climbers should have constant attention, and be tied up and trained, otherwise they will be damaged by the wind. Dahlias, chrysanthemums and carnations will require staking, as they become top heavy when in flower. Make the first sowing of winter-flowering sweet peas.

## VEGETABLE GARDEN.

Sow now—Beans, beet, cabbage, cauliflower, lettuce, peas, onions, carrots, parsnips, turnips, endive, kohl rabi, rhubarb and all herbs.

## FORESTRY.

Tree planting operations should be carried out on dull, showery days or late in the afternoons. Take care in setting out the plants, avoid bending the roots, and do not plant deeper than the plants were in the seed beds or trays. Steps should be taken to prepare seed beds for the slower growing species, i.e., pines, cypresses and callitris, and seed of these species should be sown for the following season's planting.

## GENERAL.

This is a busy time for the farmer. Weeds will be very much in evidence and difficulty will be experienced in keeping them under. Stock will have fully recovered their condition, but ticks will be troublesome. The dipping tanks must be fully utilised now.

## POULTRY.

Cockerels for future breeding should now have been selected, and those not good enough sold for killing. It pays far better to get rid of all of the latter, even if only at 1s. or 1s. 3d. per lb., than to keep them on, eating their heads off, in the hope of getting a better price. Those good enough for breeding, and they must be good, should be kept till about June; there is a demand for such up to this month. Any surplus at this time should be eaten or sold for what they will fetch. Of those selected for breeding purposes, the owner should keep the best one or two for his own use, with another as a reserve. No poultry keeper should sell his best stock, no matter how high a price is offered for it.

By the end of this month the birds selected for breeding should be mated up. If it is possible, the birds selected for breeding should be given a run on free range for three weeks or so before being put into the breeding pen and fed sparingly; better fertility and better chicks will be the result. If it is possible to run the birds selected for breeding away from the others during the whole of the breeding season, all the better. Any hens that become broody should be kept broody by setting a few china eggs under them until such time as eggs from the breeders come in. Broody hens at this time and for the next five months are valuable.

During the rainy season the scratching litter must be kept dry; if it gets wet it is useless.

Duck hatching can be continued all the year round; the main points are that the young ducks must be kept out of the sun and sleep on dry grass. Nothing is more fatal to ducklings than sun, and dampness at night; and the latter applies, too, to the adults. Unless a dry shed, with a dry, soft layer of chaff or sand, etc., covering the floor of it, is available, it is not wise to hatch turkeys till after the wet season is finished, for it will be labour, food and eggs wasted. If the young turkeys get wet they are almost certain to die. This and the feeding on wet mashes instead of dry food, chopped onions and thick milk are the chief reasons for non-success in the breeding of turkeys.

## STOCK.

Cattle.—Grass should now be at its best, and no anxiety need be felt about feed. In the case of milking cows which have been fed during the earlier rainy months, a little mealie meal, cotton cake or ground nut cake may still be given at milking, if only to bring them quietly to their places. The importance of a clean, light, airy and well-drained shelter for calves cannot be over-estimated. Calves up to three or four months old do not require a great deal of exercise, and on wet days are better left in a dry shed with a little sweet hay. A few hours' exercise on bright days in short grass is all they need. Vigilance in keeping down ticks must not be relaxed. These remarks apply specially to milking

herds and to cattle that are kraaled. Cattle running at large need little attention beyond dipping, and if the calves are not desired from November to March, the bulls must now be taken out of the herd. Weather permitting, no opportunity should be lost of getting in a supply of good sweet hay before the grass is too old. A good lick should always be provided.

Sheep.—Vleis and low-lying ground must be avoided. Sheds should be airy, dry and clean. If grass seeds are troublesome to woolled sheep, an area should be mown for them, or when rain begins to slacken, they may be shorn. If wire worm is troublesome, dose regularly each month with wireworm remedy.

### TOBACCO.

The early tobacco should now be ready for curing. Care should be taken to select only thoroughly ripe leaf for filling the barns, so that the cured product will be uniform. Topping, priming and suckering should be given attention. Selected seed plants should be carefully watched. New land intended for tobacco next year should be ploughed this month, so that all organic matter turned under may be converted into humus before planting time next season.

### WEATHER.

This is often the wettest month of the year, with marked differences of from 10 inches to 15 inches on the eastern mountain ranges, 7½ inches over Mashonaland, 4 inches to 6 inches in Matabeleland, and least, but still some, rains in the Limpopo Valley. The rains may be expected to decrease in intensity after the middle of the month if the season is normal.

# Notes from the "Gazette."

| *"Gazette" Date.* | *Items.* |
|---|---|
| | HEARTWATER. |
| 14.12.28. | His Excellency the Governor-in-Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to declare the areas defined in the schedule annexed hereto as infected with heartwater, and to make the following provision for the purpose of preventing the spread of infection of the said disease:— 1. Notwithstanding the provisions of any regulations dealing with the movement of cattle, sheep and goats, no cattle, sheep or goats shall be removed from the said areas unless such cattle, sheep and goats are free from bont ticks, *amblyomma hebraeum* and *variegatum*. |
| | Schedule. |
| | 1. The Gwanda native district. |
| | 2. The Chibi native district. |
| | 3. The Belingwe native district, excluding that portion lying north of the Belingwe Reserve. |
| | 4. That portion of the Bulalima-Mangwe native district lying south and including Radtladi Reserve, farms Romney and Reserve, Mphoengs Reserve, farms Lewisdale, Thornville, and Lion's Park, Semokwe Reserve. |
| | 5. In the Nyamandhlovu native district, the Gwaai Reserve, the farm Gutamegwa and unalienated land. |
| | 6. That portion of the Bubi native district lying west and north of the farms Westland Row, Bembezaan, Westgate, Molecomb, Goodwood Block, Gourlay's Block, Creceus, Bubi Block and Kenilworth Block. |
| | 7. The Wankie native district. (G.N. No. 828.) |
| | POUND. |
| 7.12.28 | The pound at Donnington farm, Hartley district, has been abolished. (G.N. No. 807). |
| | GAME LAW CONSOLIDATION ORDINANCE, 1906. |
| 7.12.28. | Government Notices Nos. 441 of 1920, 84 of 1923 (dated 30th November, 1923), 182 of 1927, 197 of 1927, 302 of 1927, 540 of 1927, 599 of 1927, 588 of 1928 and 657 of 1928 are cancelled, and certain defined areas in the Melsetter, Darwin, Lomagundi and Hartley districts are, with restrictions as notified in the Gazette, declared open areas for the shooting of game. (G.N. No. 808.) |

# Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

## AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 388. Kudzu Vine, by H. G. Mundy, F.L.S.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 456. Legumes in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 509. Cotton Culture in Southern Rhodesia, by D. D. Brown.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 539. Barley Growing.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 546. Notes on Fertilisers and Soil Treatment, by T. J. Mossop.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 616. The Ground Nut or Monkey Nut, by C. Mainwaring.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.

No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.
No. 684. Warning to Maize Growers: Maize for Export.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Fóods, Seeds and Pest Remedies Orrdinance" during the year 1927-28.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
Botanical Specimens for Identification.
Maize Grading Regulations.

## REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.
No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.
No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.
No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy. F.L.S.
No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.
No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.

No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.
No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.
No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.
No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.
No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H G. Mundy, F.L.S.
No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.
No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.
No. 564. A Maize Rotation Experiment, by A. R. Morkel.
No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.
No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.
No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.
No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.
No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.
No. 685. Notes on Farm Practices at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.

## TOBACCO.

No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.
No. 607. Tobacco Seed Beds, by D. D. Brown.
No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.
No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.
No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.
No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.
No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.
No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).
No. 661. Flue-Curing Tobacco Barns, 12 ft. x 12 ft. x 16 ft., by B. G. Gundry.
No. 665. Tobacco Pests of Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.
No. 671. Wildfire and Angular Spot of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.
No. 676. Mosaic Disease of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.
No. 679. Tobacco Culture in Southern Rhodesia: The Harvesting and Curing of Virginia Tobacco, by D. D. Brown.

No. 689. The Lesser Tobacco Wireworms, by Rupert W. Jack, F.E.S.
No. 690. Thermal Efficiency of Tobacco Barns and Furnaces, by C. L. Robertson, B.A., B.Sc., A.M.I.C.E.
No. 692. Frenching of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A
No. 715. Turkish Tobacco Culture in Southern Rhodesia, by D. D. Brown, Chief Tobacco Expert.
No. 718. Preliminary Experiments on the Control of White Mould of Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 247. Statistical Returns of Crops Grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and Fred Eyles, F.L.S.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
No. 361. Statistics of Live Stock and Animal Produce for the Year 1919, by F. Eyles, F.L.S.
No. 380. Statistics of Crops Grown by Europeans in Southern Rhodesia, 1919-20, by H. C. K. Fynn.
No. 393. Statistics of Live Stock and Animal Produce for 1920, by H. C. K. Fynn.
No. 409. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1920-21, by H. C. K. Fynn.
No. 426. Statistics of Live Stock and Animal Products for the Year 1921, by H. C. K. Fynn.
No. 443. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1921-22, by F. Eyles, F.L.S., and H. C. K. Fynn.
No. 459. Statistics of Live Stock and Animal Products for the Year 1922, by A. Borradaile Bell.
No. 484. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1922-23, by A. Borradaile Bell.
No. 502. Winter Crops, 1923, by A. Borradaile Bell.
No. 527. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1923-24, by A. Borradaile Bell.
No. 543. Statistics of Live Stock and Animal Products for the Year 1924, by A. Borradaile Bell.
No. 580. Statistics of Summer Crops Grown by Europeans in Southern Rhodesia for the Season 1924-25, by A. Borradaile Bell, Statistician.
No. 595. Statistics of Live Stock and Animal Products for the Year 1925, by A. Borradaile Bell, Statistician.
No. 626. Statistics of Summer Crops grown by Europeans in Southern Rhodesia for the Season 1925-26, by A. Borradaile Bell, Statistician.
No. 646. Statistics of Live Stock and Animal Products for the Year 1926, by A. Borradaile Bell, Statistician.
No. 682. Agricultural Returns for 1926-7 : Preliminary Returns, by Thomas G. Gibson, Government Statistician.

## LIVE STOCK.

No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 336. Butchering and Flaying.
No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.
No. 381. From Breeder to Butcher; Cattle Feeding Experiment No. 8, by Eric A. Nobbs, Ph.D., B.Sc.
No. 421. From Breeder to Butcher; Cattle Feeding Experiment No. 9, Government Experiment Farm, Gwebi, by E. A. Nobbs, Ph.D., B.Sc., F.H.A.S.
No. 446. From Breeder to Butcher; Cattle Feeding Experiment No. 11, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc., F.H.A.S.
No. 448. The Cattle Industry.
No. 468. From Breeder to Butcher; Cattle Feeding Experiment No. 13, by Eric A. Nobbs, Ph.D., B.Sc.
No. 483. From Breeder to Butcher; Cattle Feeding Experiments Nos. 14 and 15, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc.
No. 584. Merino Sheep in Southern Rhodesia, by H. W. Hilliard.
No. 624. The Construction of Dipping Tanks for Cattle (Revised).
No. 698. The Rearing of Bacon Pigs for Bacon Factory Purposes, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 701. Feeding Bullocks at Gwebi, by S. D. Timson, M.C., Dip.Agric.
Arsenite Cattle Dip—How to Mix.

## DAIRYING.

No. 511. Bacon Curing on the Farm, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 520. Treatment of Gassy Curds in Cheese-making, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 530. The Dairy Industry: Causes of Variation in Cream Tests, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 562. Bacteria and the Dairy Industry, by J. R. Corry, B.Sc. (Agr.).
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THE RHODESIA

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## Editorial.

*Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.*

**Pasture Improvement in Rhodesia.**—Stock farmers in this Colony will be pleased to learn that research work on pasture improvement will be commenced this season in conformity with similar work that is being carried out in other parts of the Empire, aided by grants from the Empire Marketing Board. The necessary staff will be engaged in the near future, and it has been decided that research work will be carried out both in Mashonaland and in Matabeleland. The Matopo Government farm has been selected as the centre of operations in Matabeleland, and it is probable that an area in the Rusape district will be chosen for the work in Mashonaland. We might mention also that the experiments at the Agricultural Experiment Station, Salisbury, referred to by the Chief Chemist in the issue of this Journal for September, 1928, are being continued this season.

It is probable that the Chief Chemist, who will be in charge of the pasture research work, will shortly visit the Union of South Africa for the purpose of establishing contact with scientists there and to ascertain the stage to which research has advanced on this subject in that Dominion. On his return definite plans will be drawn up, details of which it is hoped to publish in this Journal.

It is of interest to note that a research officer who is conducting work along similar lines at the Waite Institute, New South Wales, visited this Colony at the beginning of the year under the auspices of the Empire Marketing Board in order to discuss problems associated with pasture improvement with the Chief Chemist.

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**Careless Handling of Dipping Fluids.**—We have previously drawn attention in this Journal to mortality occurring among cattle on farms, due to arsenical poisoning. Investigation has invariably shown that the trouble is caused by the careless handling of dipping fluids. We are informed by the Chief Veterinary Surgeon and the Chief Chemist that in spite of warnings, such instances continue to occur, and it is obvious that proper care is not being taken. We understand that recently 54 head of cattle died on one farm from arsenical poisoning, while many more were ill with similar symptoms. Investigation showed that the cattle had been smeared with what was believed to be a mixture of paraffin, petrol and oil; in reality the mixture contained a strong arsenical dip as the third ingredient, with the result stated. It frequently happens that cattle die from licking up dip which has been spilt on the ground. Such carelessness is very reprehensible.

The potency of arsenite of soda as a poison does not seem to be sufficiently realised, and we consider it again necessary to issue a warning that the greatest care should be exercised in handling concentrated arsenical dips.

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**Tsetse Fly Disease of Cattle.**—Attention is directed to the article which appears in this issue of the Journal by Mr. Ll. E. W. Bevan, Director of Veterinary Research, describ-

ing a method elaborated by him for inoculating cattle against trypanosomiasis. A large area of this Colony, including valuable agricultural and highly mineralised land, is to-day held ransom by the tsetse fly. Any measure which will render the fly innocuous and thus allow these vacant spaces to be opened up for settlement will help forward very considerably the development of the Colony. Mr. Bevan has been working on such a measure intermittently for 20 years, and the article records the results of his researches up to the time he went on leave last year. As will be seen from the final paragraph of the article, Mr. Bevan is careful to point out that the method of inoculation he is endeavouring to elaborate is not the last word on the subject. Thus, "It is not claimed that the above method, so sketchily described, will solve all our difficulties in connection with bovine trypanosomiasis, a subject bristling with complications. For example, it is by no means certain that it is applicable to types of infection other than those caused by *T. congolense*, or even applicable to all strains of *T. congolense* infection."

Since the publication of this article in the *Transactions of the Royal Society of Tropical Medicine and Hygiene*, Mr. Bevan has returned to Southern Rhodesia and has carried out further researches with a view to perfecting the method described. Although, as anticipated, he has encountered many complications, he still feels that the result of his investigations offers every prospect of success. The importance of such an eventuality cannot be over-emphasised.

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**A National Effort.**—Results are beginning to accrue from the effort made to popularise Rhodesian tobacco with the British smoking public. Press articles, the work of the special emissary sent to England, the advertising campaign of the Empire Marketing Board and the thrust of the Rhodesian Tobacco Gift Fund—each has played its part in the great effort. The illustration which we reproduced in the last issue of the Journal of Mr. Amery offering Lord Cushendun a Rhodesian cigarette shows that His Majesty's Government are with us in our efforts to create a sale for this Empire product. The public now realises that this is not an attempt to foist upon them an article of inferior quality

merely because it is grown in the Empire, but that what they are asked to buy is equal in quality to the foreign product that has received their patronage for so long.

Excellent as is the progress made, there must be no relaxation of effort. There is a vast field to conquer and there are many prejudices and difficulties to overcome. A good beginning has been made and we must see to it that these results are followed up. There is evidence of an increasing desire among the consumers in the United Kingdom to purchase Empire goods in preference to foreign, provided that the quality is equal. It goes without saying that from a growing point of view the quality of our tobacco must be maintained.

In our opinion one of the best means by which we who are resident in the Colony can help is by way of the Rhodesian Tobacco Gift Fund. The personal element in this form of propaganda is its great asset, and we have tangible evidence of the good results which have accrued from a solitary gift of Rhodesian cigarettes. For instance, in one large London concern, employing several thousands of men and women, many are smoking Rhodesian cigarettes as the outcome of a timely gift. We would stress the vital necessity of continuing these gifts, which after all only cost 5s. and may easily be repaid a thousandfold. Let there be no procrastination; let us make full use of the machinery which has been set up, and induce our friends to do likewise.

The address of the Secretary of the Rhodesian Tobacco Gift Fund is P.O. Box 713, Salisbury, to whom remittances can be sent with the name or names of the persons to whom gifts of tobacco are to be forwarded.

**Timber Resources of Southern Rhodesia.**—Scattered throughout the Colony are many kinds of indigenous trees, but comparatively few have been tested as to their suitability for various industrial purposes. Some of those that possess naturally durable wood are used to a limited extent for furniture, wagon wood, railway sleepers, etc. Furniture made from bloodwood and the various mahoganies compares favourably with that manufactured from exotic timber.

Naves (hubs) turned from pod mahogany are in great demand and railway sleepers cut from redwood are used in the Colony and are exported in large numbers to the Union of South Africa.

Among the non-durable timbers are to be found many that possess excellent qualities, but their uses are restricted owing to attacks by various kinds of boring insects and the difficulties associated with their seasoning. Successful methods have been evolved to combat insect pests, and there is now no difficulty in rendering wood immune both from insects and fungi, but research work is still necessary to determine the most suitable methods for seasoning the various kinds of wood. The difficulties experienced in seasoning wood in this Colony in the ordinary way by storing are partly climatic. The very pronounced wet and dry seasons are a severe strain on most kinds of wood. The dry season is responsible for what is technically called "case hardening," that is, a rapid drying out of the water content in the outer layers which prevents even drying. In consequence of this, serious defects are caused by warping, checking and cracking.

In recent years various types of kilns have been devised by means of which heat, moisture and air circulation are under direct control, and because of this the moisture content of wood can be withdrawn in such a manner that a perfectly seasoned article can be produced in a comparatively short period. The Union Forest Department has been using for some time various types of kilns at Pretoria, both for seasoning indigenous wood and that of various species of exotic trees grown in the Union.

In order that advantage may be taken of the experience gained by the Union Forest Department, the Minister of Agriculture has given his approval for an officer of the Rhodesia Forest Service to proceed to Pretoria and study the various details of kiln drying of timber. The Chief Conservator of Forests of the Union has courteously granted the necessary permission. Mr. T. L. Wilkinson, M.Sc., has been selected for the duty and will be proceeding to Pretoria in April. On his return to the Colony Mr. Wilkinson will make an intensive study of the various indigenous timbers, and all the facts gathered will be available for those who are in-

terested in the utilisation of the Colony's abundant wood resources.

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**The Use of Producer (Suction) Gas for Tractors.**—It has been the endeavour of this Journal to keep the farmers of this Colony posted with modern developments in the use of suction gas as fuel for tractors, for it is realised that with the high cost of petrol and paraffin a cheaper fuel is necessary for the more general employment of tractive power. A considerable amount of experimental work has been carried out in recent years with the object of designing a light portable suction gas outfit which will develop a sufficient volume of gas to enable it to operate tractors and lorries with little loss of power as compared with that developed when paraffin or petrol is used as fuel. A report recently issued by the Royal Agricultural Society of England summarises the results of these experiments. Thus: "The question of producer gas is scientifically dealt with in an article from Northern Africa. The writer found that feeding an ordinary petrol motor with producer gas reduces the power available by about 30 per cent. In French trials, conducted by M. Coupan, the difference in power between the same type of tractor used with petrol and with producer gas was found to be only about 10 per cent. A table summarising the results of trials in 1922, 1923 and 1925 is encouraging as showing a diminution in consumption amounting to 35 per cent. and an increase in power of 50 per cent., while impurities in the gas, which in 1923 were 66 milligrammes per cubic metre, fell to nothing in 1925." The question of producer gas is also briefly referred to by the Fuel Research Board in a memorandum published in 1927 and reference made to French trials of motor lorries in 1926, in which "all the vehicles were reported to have passed through the trials satisfactorily, and this method of operating motor lorries can be said to have passed the experimental stage."

A further reference states that at a conference held in connection with a demonstration at Blois in May, 1927, the fuel cost of ploughing land with producer gas to a depth of from 7 to 8 ins. was said to be about 1s. 3d. per acre, while the fuel cost for a producer gas tractor driving a thrashing machine was as little as 6d. per ton of grain thrashed.

Referring to trials with portable appliances for the manufacture of charcoal, an extract is given from the *Engineer*, in the course of which it is stated that it is generally accepted that mechanical carbonisers have reached a stage of practical realisation when they can be employed by owners of fleets of lorries to produce all the fuel they may need at a very low cost for the running of their vehicles.

Summarising an article written by M. Ringelmann in a French publication, it is stated: "He says that for ordinary work, labour or transport one litre of petrol is the equivalent of 1.5 kilos of charcoal. He compares the cost of petrol and charcoal by supposing a tractor to be worked for 60 days a year at 70 litres (say, 15 gallons) a day. This would require 4,200 litres (say, 900 gallons), costing 9,660 francs (say, £75). The farmer might substitute for every litre of petrol 1.5 kilos of charcoal, or 6,300 kilos for the year; and assuming that he need not pay for his brushwood, he could produce this amount, allowing for depreciation on his machinery, for 3,580 francs, thus saving altogether 6,080 francs, or nearly £50."

Reference is also made in the report to an English-made road roller, operated with producer gas, shown at the Public Works Road and Transport Exhibition in November, 1927. This, instead of requiring charcoal, is fed direct with wood. It uses from 20 to 30 lbs. of wood per hour, and it is claimed that with waste wood at 10s. per ton the whole cost for fuel and lubrication for a 15-ton roller is only 2d. per hour. It is stated that hard wood is preferable, but if soft woods are used they should be dry, as wet woods release too much water in the gasagene.

**Protection of Bee Hives from Badgers.**—A correspondent enquires if jackal-proof wire netting will protect bee hives from badgers. If not, he asks if there is any way, other than by keeping the hives in a brick building, as described by Mr. W. P. Alexander in the *Rhodesia Agricultural Journal* of September, 1926.

We shall be glad if a reader with experience of protecting bee hives from these animals will enable us to reply to this enquiry.

# A Method of Inoculating Cattle against Trypanosomiasis.

By Ll. E. W. Bevan, M.R.C.V.S., Director of Veterinary Research, Southern Rhodesia, Fellow of the Royal Society of Tropical Medicine and Hygiene.

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In 1908, when studying at the Pasteur Institute, Paris, I had the good fortune to meet Major J. Kerandel, a medical officer of the French "Troupes Coloniales," who, having contracted trypanosomiasis in the Congo, had been successfully treated with subcutaneous injections of atoxyl and intravenous injections of emetic. The details of this treatment, which were subsequently published in the *Bulletin de la Société de Pathologie Exotique*, Tome III., No. 9, 1910, entitled "Un cas de trypanosomiase chez un medecin (auto-observation)," were carefully explained to me, and on my return to Southern Rhodesia in 1909 I decided to ascertain the effect of these drugs upon cattle suffering from trypanosomiasis. A favourable opportunity soon presented itself in the Hartley district, where a large number of cattle introduced by recently arrived settlers had become "fly-struck," and a heavy mortality from trypanosomiasis had occurred. A careful investigation as to the species of trypanosome and the manner of its transmission was made and recorded in an *Interim Report on the Animal Trypanosomiases of Southern Rhodesia* (Official Bulletin No. 26, February, 1910).

Considerable difficulty was experienced in determining the identity of the trypanosome encountered in these animals, which was increased by the fact that at the time the classification of the small animal trypanosomes was very unsettled.

In the light of our present knowledge the principal animal trypanosome of Southern Rhodesian cattle appears to belong to the congolense group and its principal means of transmission to be by the *Glossina morsitans*, the common "tsetse fly" of the country. *Trypanosoma vivax* also is found occasionally in cattle, and more rarely a very small trypanosome which may be *T. nanum* or merely a small form of *T. congolense*. *T. brucei* is frequently infective to equines, but has not been detected in bovines. The experiments recorded in this note have been carried out with the trypanosomes of congolense type.

The disease caused in cattle by these parasites differs. Rarely an acute form is met with, especially in the rainy season, when cattle die suddenly although perhaps in good condition. More commonly the disease runs a subacute or chronic course, and infected animals may live many months, especially during the prolonged dry season. The cold nights of the winter period, shortage of grazing, overwork and underfeeding, or exposure to the early rains, frequently bring about a heavy mortality among such animals. It is possible that a few recover or become "tolerant" without treatment, but these have not been encountered by the writer. It was to animals in the last stages of the disease that the treatment was first applied, but during the past twenty years it has been adopted on a wholesale scale and animals in all stages of infection have benefited from it.

The earliest experiments, carried out in May, 1909, demonstrated the fact that large doses of potassium antimonyl tartrate could be well tolerated by bovines if warmed to body heat and carefully injected direct into the jugular vein. The dose decided upon for adult cattle was 1 gramme dissolved in 100 c.cm. of boiled water, smaller quantities being used for young stock. This dose of the drug has been adhered to even to the present day, and there appears to be no necessity to reduce or increase it. The ill effects recorded by Hornby have not been noticed in Southern Rhodesia. They may have occurred, but they have not been of any practical importance. The treatment has been applied to many thousands of head of cattle during this long period, and ill effects following it have been so few and far between that there does not appear to be any justification for withholding

it. In one instance the sudden death of ten animals followed treatment when the antimonyl potassium tartrate had been dissolved by a veterinarian in water taken from a local stream. The deaths were probably due to some impurity in the water, and since then the drug has always been dispensed at the laboratory in Salisbury and issued in solution. From this and other practical observations it is thought that water free from chemical and other impurities is essential.

A serious and practical difficulty in connection with the antimony treatment is the fact that such large quantities of the solution must be injected direct into the vein, for if any of it escape under the skin, abscesses or necrosis and sloughs may occur. To avoid this the animal has to be thrown and secured, and this rough handling is in itself harmful to sick animals. The time and labour involved make the operation unpopular, not only with the stock owners, but with the veterinary officials who are generally called upon to assist them. It is most desirable that a more simple method of introducing the antimony be found, and for many years experiments to this end have been carried out, with, however, little success. Solutions of potassium antimonyl tartrate are markedly acid, and when rendered alkaline the insoluble antimony tri-oxide, having little or no therapeutic value, is thrown out. By very careful adjustment a neutral solution can be produced which appears to be less harmful to the tissues. Such a solution is now prepared by Bayer in the form of "antimosan," which may overcome these difficulties. It would appear from his annual report that experiments in this connection are already in the capable hands of Hornby working in Tanganyika, and similar investigations will be continued in Rhodesia on my return. The assistance of Fellows of this Society who are faced with a similar difficulty in the treatment of kala-azar, bilharzia and other human diseases would be of considerable value and might hasten the solution of the problem.

When the treatment suggested by Kerandel was first applied it was difficult to obtain atoxyl, but a large stock of arrhenal (methyl arsenate of soda) was available, having been imported for the treatment of malaria, blackwater fever and South African horse-sickness, for which it was a much vaunted remedy. Subcutaneous injections of 1 gramme in

50 c.cm. of sterilised water were applied alternately with the intravenous injections of antimony. Experience in the laboratory and in the field soon indicated that the virtue of the treatment lay in the antimony rather than the arsenic, and the latter was discontinued. It is possible that the tonic effects of the arsenic may have been beneficial, and practical stock owners still speak with respect of the old "double" method which they claim to have been superior to that adopted at the present time.

It has to be confessed that in the past the antimony treatment has been largely empirical. The manner in which it acted and, therefore, the correct dose and the proper time or method of applying it were not known. Some advocate massive doses with a view to bringing about sterilisation (*dosa maxima sterilans*), but in the light of Hornby's work it is possible that these were actually harmful, and it is doubtful whether cure by completely sterilising the host was frequently, if ever, effected. As the result of the observations to be described later, this would not appear to be necessary. Then again authorities differed as to the length of the intervals between the doses, some considering that short intervals of three to five days were necessary, others recommending a series of doses at fortnightly intervals extending over a considerable period.

During the past eighteen years in Southern Rhodesia the method of treatment has varied from time to time, and in this respect the good results achieved must be attributed to luck rather than judgment.

As to the manner in which the drug acted, it was long since realised that a cure was only rarely effected, the blood of apparently recovered animals being proved to be infective even when they were in the best of condition. A similar phenomenon was met with in cattle suffering from piroplasmosis when treated with trypan blue, and in 1912 it was suggested that this drug, the results of which are almost miraculous, acted by splitting up the piroplasms and liberating their toxins, against which in due course the anti-toxins were formed, so that thereafter the parasite was, as it were, disarmed.

It was thought that the antimony might act in a similar manner upon the trypanosome, and experiments at the

laboratory appeared to confirm that view, as will be seen from the records of treated animals accompanying this note. The fact that, for a period after the second exhibition of the drug, although the trypanosomes continued to increase in number the treated animals improved markedly in condition, indicates that the parasites were no longer producing their harmful effects. That they were still capable of doing so when introduced into a susceptible untreated animal suggests that the parasites had not been rendered harmless, but that protection or "tolerance" had been acquired by the host. On this assumption it became necessary to ascertain how best to exhibit the drug in order to bring about the production of the greatest quantity of protective elements. It was thought that, if this could be determined, it might become possible to set up in cattle a condition comparable with that existing in game in "fly" areas, which harbour the trypanosome although unharmed by it, and are constantly exposed to the bite of the tsetse fly, but resistant to re-infection.

When the antimony treatment was first adopted in Southern Rhodesia it was applied only to those animals which were obviously sick, and it frequently happened that these were so thin and weak that recovery was delayed until a plentiful supply of green grass during the summer rains supplied the necessary food and nourishment which their owners had denied them during the winter drought. Transport oxen also were frequently returned to the yoke long before recovery was complete, and deaths from starvation and exhaustion rather than trypanosomiasis were recorded as evidence of the failure of the treatment. It was therefore decided to recommend that, in herds or spans liable to infection, treatment should commence as soon as the animals manifested any of the characteristic symptoms of the disease. Owners soon became remarkably adept at detecting such animals, and not uncommonly confirmed their diagnosis by referring blood smears to the laboratory, where they were examined free of charge. On certain farms and estates where, owing to the presence of the tsetse fly, animals were in constant danger of infection, it was decided to treat all animals periodically in the hope of arresting the disease in the newly infected during its early stages. On one tobacco plantation, where the section managers had lost most of their

cattle used for ploughing and cultivating, it was decided to re-stock and adopt this principle, with the result that for some time past as many as three hundred and sixty head have been treated once a month as a regular routine. The mortality has thus been reduced to one or two animals which have died as the result of accident. The work entailed in this process, however, has been considerable, and an official has had to be detailed to assist. It is only on estates belonging to wealthy owners or companies that a sufficient staff of labour, native and European, exists to permit of this addition to the ordinary farm routine, already sufficiently onerous for the small farmer or transport rider.

Realising the value of this method, but the difficulties associated with it, the writer sought to improve it, and was guided in his efforts by certain observations which in the course of his somewhat lengthy experience had appeared to him to have a practical bearing upon the problem. The first was the well-known fact that wild animals, living in tsetse-infected areas, harboured the trypanosome although unharmed by it, and were apparently resistant to re-infection. The second, that infected cattle, which recovered as the result of treatment, similarly continued to "carry" the trypanosome, and appeared to be remarkably resistant to re-infection. Time after time it was found that treated animals lived where untreated animals died. Thirdly, it was found that large doses of the drug were unnecessary, and that recoveries occurred and treatment appeared to be just as successful when circumstances, such as shortage of labour, long distances to travel, and so on, prevented the frequent exhibition of the drug. It was realised that success had often followed where only one, two or three injections had been possible.

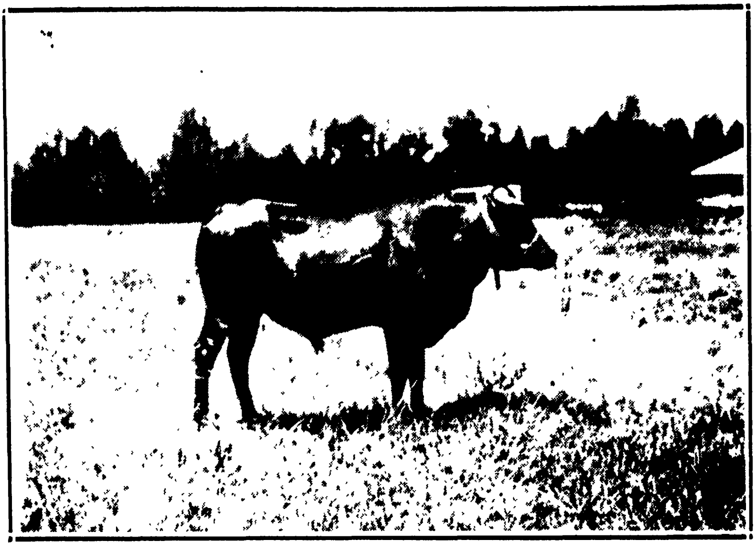
Again, he had for many years been inoculating valuable cattle, imported to Southern Rhodesia from the Union of South Africa and overseas for the improvement of the indigenous cattle of the country, against piroplasmosis and anaplasmosis, two tick-borne diseases which, when contracted naturally, generally proved fatal. The method devised by him was to standardise a strain of these parasites by passage through the calves of native cattle until an attenuated virus was arrived at, which, when introduced into highly suscep-

tible animals, or rather exotic animals with low resistance, caused in them mild infections from which they recovered, and as the result acquired "tolerance" or immunity against natural infection. When in certain animals the "red-water" or piroplasmosis reaction had shown signs of getting "out of hand," it had been the custom to shut it off by an injection of trypan blue, which, as stated before, immediately cured the animal of the acute attack and left it a carrier of the parasite, but resistant to re-infection.

It was upon the basis of these considerations that it was decided to endeavour to devise a method of inoculating cattle against trypanosomiasis comparable to that employed in the protection of imported stock against piroplasmosis, for it was felt that if cattle could be inoculated with a known virus and be appropriately treated before natural exposure in the "fly" areas, the necessity for monthly treatment in the hope of catching the cases newly infected during the intervals, with all the labour and inconvenience involved, would be done away with. In other words, it was thought if the artificially infected animals did not suffer more severely than naturally infected ones, and responded as satisfactorily to treatment, and thereafter exhibited as great a resistance to natural re-infection, the immediate risk would be preferable to the prolonged anxiety associated with the risk of natural infection.

To this end experiments were carried out with a view to establishing a suitable virus, that is, a strain of *T. congolense* having (1) a more or less defined period of incubation; (2) a period when the greatest number of trypanosomes were present in the peripheral blood; (3) a marked response to antimony treatment. It was thought, as the result of experience, that successful treatment depended chiefly upon careful "timing" based upon the development of the parasite and its appearance in the blood stream, and this supposition proved to be correct.

The blood of cattle naturally infected with *T. congolense* in various districts was collected and studied in laboratory animals, and it was found that the period of incubation was generally about ten days. By the fourteenth day trypanosomes were generally plentiful in the peripheral blood. These disappeared on intravenous injection of 1 gramme of



Africander steers after inoculation against Trypanosomiasis by Mr. Bevan's new method.

potassium antimonyl tartrate in 50 c.cm. of sterile water, and remained absent for periods varying from seven to eleven days. In all cases they had re-appeared by the fourteenth day after the first injection. A second injection on that day again resulted in their disappearance for longer or shorter periods, but as a rule they were again demonstrable in fourteen days and remained present until a third injection, given one month after the second. They then disappeared, and only very rarely re-appeared in very small numbers, although in some cases daily search was made for them for many weeks and bi-weekly examinations for many months. That the animals were not cured but were merely rendered "tolerant" is shown by the fact that in most cases under careful observation an occasional parasite, sometimes only one in a hundred fields examined, was encountered.

With regard to the clinical condition of the inoculated animals, no ill effects could be noticed during the period of incubation, but on the first appearance of the parasites the temperature became elevated, the animal appeared slightly dull, with hanging head, drooping ears, lacrimation and staring coat. These symptoms were not well marked and might have been overlooked by any but a careful observer. From this time onward until about six weeks after the inoculation—that is, about fourteen days after the second treatment—the animals lost condition and had the characteristic appearance of so-called "fly-struck" cattle. After that time, and before the third treatment, they commenced to improve and the lost condition was rapidly recovered. It is a remarkable fact that a certain span of working oxen sent to the Veterinary Research Station, running out day and night in the heavily stocked paddocks where grazing was none too plentiful, exposed to heat by day and frequent heavy rains, left the station two months after inoculation in better condition than it arrived.

Experiments were also carried out to test the resistance of treated animals to re-infection. In the field this has been demonstrated, but in order to put it to laboratory test a highly virulent strain of *T. congolense* was prepared by passage through rats, the duration of the disease in which was reduced from twenty-one to nine days. The "tolerance" of treated animals did not break down when they were inoculated with large doses of this strain, nor with infected

blood from cattle dying from natural infection in the "fly" areas from which the inoculation strain originated. Whether they would prove equally resistant to all strains, that is, strains of *T. congolense* from all districts, remains to be proved. If not, however, it is only necessary to select as a virus for inoculation the strain of trypanosome obtaining in the areas in which the cattle are to be exposed.

A number of inoculated and treated animals have been subjected to natural infection which they have resisted, but on the writer's return to Southern Rhodesia he hopes to accompany a large number of such animals into known "fly belts" and make careful observations and reports of the results.

One apparent failure which demonstrated a point of great practical importance occurred. A number of treated animals were sent into a "belt" to become naturally infected with trypanosomiasis. They all died, but of piroplasmosis, not trypanosomiasis. The fact was overlooked that the area on which these animals had been born and reared had by prolonged and systematic "dipping" been freed from ticks, and these animals had therefore grown up susceptible to tick-infection. The circumstance also drew attention to the danger of transmitting bovine infections other than trypanosomiasis in the blood from the "reservoir" animals. This danger was overcome by using sheep as the virus carriers. In them the strain can be definitely fixed at the laboratory and they can be conveyed to the place where the inoculation is to be performed. Needless to say, this should not be in the tsetse infested area where the inoculation reactions might be complicated by natural infection.

It is not claimed that the above method, so sketchily described, will solve all our difficulties in connection with bovine trypanosomiasis, a subject which is bristling with complications. For example, it is by no means certain that it is applicable to types of infection other than those caused by *T. congolense*, or even to all strains of *T. congolense* infection. The method in its present state is very far from perfect, but, being based upon the observations and results of many years' practical experience in the trypanosomiases of Southern Rhodesia, it is presented for what it is worth, and in the hope that it may suggest a line of research for other workers and possibly, at the long last, lead to the opening

up of the many millions of acres of valuable territory in tropical and sub-tropical Africa, now "held up" by the tsetse fly, to profitable development and settlement.

## SUMMARY.

1. The common trypanosome of cattle in Southern Rhodesia is caused by a strain of *Trypanosoma congolense* and is transmitted by the tsetse fly, *Glossina morsitans*.

2. Treatment by means of intravenous injections of potassium antimonyl tartrate was first introduced into Southern Rhodesia in 1909 and has since proved successful in saving the lives of many thousands of animals.

3. In the past it was frequently applied to animals so far advanced in the disease that their recovery was unduly prolonged, but recently animals in the early stages of infection have been detected and treated with better results.

4. On some estates cattle in danger of infection have been treated systematically once a month. This course has been adopted in order to ensure the treatment of recently infected animals. It involves considerable labour and expense.

5. To avoid this a method is suggested whereby cattle can be inoculated, treated and rendered "tolerant" before exposure to natural infection.

6. The method involves the standardisation in sheep of the strain of trypanosome of the area in which the animals are to be exposed to natural infection, and treatment with potassium antimonyl tartrate appropriately "timed" upon the basis of the appearance and re-appearance of the parasite in the peripheral blood.

7. In order to avoid the transmission of bovine diseases other than trypanosomiasis, sheep are used as the reservoirs of the virus. These can be conveyed easily to the place where the inoculation is to be performed, which must not be within the infected area.

8. A form of antimony which can be injected subcutaneously is urgently required for practical reasons.

9. The above method may be applicable only to the conditions obtaining in Southern Rhodesia, but it is hoped that workers in other parts of Africa will put it to experimental test.

# RECORDS OF TWO INOCULATED AND TREATED ANIMALS.

## 1.—AFRICANDER STEER No. 468.

| Date. | Day. | Temperature. | Trypanosomes in 100 fields. | Remarks. |
|---|---|---|---|---|
| 24.7.26 | — | Normal | Nil | Inoculated with blood containing trypansomes from sheep No. 430 |
| 4.8.26 | 11 | Elevated | Nil | —— |
| 5.8.26 | 12 | ,, | 300 | Treated—P.A.T. |
| 6.8.26 | 13 | Normal | Nil | Dull |
| 14.8.26 | 21 | Elevated | ,, | Turned out into paddock |
| 16.8 26 | 23 | Normal | 2 | Obviously sick |
| 18.8.26 | 25 | Elevated | 16 | —— |
| 19.8.26 | 26 | Normal | 50 | Treated—P.A.T. |
| 20.8.26 | 27 | ,, | Nil | Losing condition |
| 20-31.8.26 | 38 | ,, | ,, | ,, ,, |
| 31.8.26 | — | Elevated | 2 | ,, ,, |
| 2.9.26 | 40 | Irregular | 20 | ,, ,, |
| 4.9.26 | 42 | ,, | 60 | ,, ,, |
| 6.9.26 | 44 | ,, | 8 | ,, ,, |
| 7.9.26 | 45 | ,, | 25 | ,, ,, |
| 8.9.26 | 46 | ,, | 6 | ,, ,, |
| 9.9.26 | 47 | ,, | 4 | ,, ,, |
| 10.9.26 | 48 | Elevated | — | Condition improving |
| 12.9.26 | 50 | Normal | 90 | ,, ,, |
| 13.9 26 | 51 | ,, | 1 | ,, ,, |
| 14.9.26 | 52 | ,, | 5 | ,, ,, |
| 15.9.26 | 53 | ,, | Nil | ,, ,, |
| 16.9.26 | 54 | ,, | 10 | ,, ,, |
| 17.9.26 | 55 | ,, | 40 | ,, ,, |
| 18.9.26 | 56 | Elevated | 12 | Very hot weather |
| 19.9.26 | 57 | ,, | 6 | Condition improving |
| 20.9.26 | 58 | ,, | 1 | ,, ,, |
| 21.9.26 | 59 | ,, | 120 | ,, ,, |
| 22.9.26 | 60 | ,, | 50 | ,, ,, |
| 23.9.26 | 61 | ,, | 16 | ,, ,, |
| 24.9.26 | 62 | ,, | 30 | ,, ,, |
| 25.9.26 | 63 | ,, | 10 | Treated |
| 26.9.26 | 64 | ,, | 0 | Condition improving |
| 9.11.26 | 108 | Normal | 0 | No parasites seen. Daily search since 26.9.26 |
| 10.11.26 | 109 | ,, | 0 | First rains |
| 25 1.27 | 185 | ,, | 0 | No parasites seen. Bi-weekly search since 10.11.26 |
| 26.1.27 | 186 | ,, | 0 | Re-inoculated. Blood of infected sheep 473 and 455 |
| 28.1.27 | 188 | ,, | 0 | —— |
| 30.1.27 | 190 | ,, | 0 | Heavy rain |
| 2.2.27 | 193 | ,, | 0 | —— |
| 9.2.27 | 200 | Elevated | 12 | Good condition |
| 10.2.27 | 201 | ,, | 0 | ,, ,, |
| 1.5.28 | 646 | Normal | 0 | No parasites again seen. Frequent search. Condition excellent |

## 2.—AFRICANDER STEER No. 469.

| Date. | Day. | Temperature. | Trypanosomes in 100 fields. | Remarks. |
|---|---|---|---|---|
| 24.7.26 | — | Normal | Nil | Inoculated with blood containing trypanosomes from sheep No. 430 |
| 26.7.26 | 2 | ,, | ,, | —— |
| 5.8.26 | 12 | ,, | 200 | —— |
| 6.8.26 | 13 | ,, | 150 | —— |
| 7.8.26 | 14 | ,, | 80 | —— |
| 8 8.26 | 15 | ,, | 100 | Dull |
| 9.8.26 | 16 | Elevated | — | Treated—P.A.T. |
| 10.8.26 | 17 | Normal | Nil | —— |
| 13.8.26 | 20 | ,, | ,, | —— |
| 14.8.26 | 21 | Elevated | ,, | Turned out into paddock |
| 16.8.26 | 23 | Normal | ,, | Losing condition |
| 18.8.26 | 25 | ,, | ,, | ,, ,, |
| 19.8.26 | 26 | Elevated | 9 | ,, ,, |
| 20.8.26 | 27 | Normal | 60 | Treated—P.A.T. |
| 21.8.26 | 28 | ,, | Nil | Losing condition |
| 25.8.26 | 32 | ,, | ,, | ,, ,, |
| 31.8.26 | 38 | Elevated | ,, | ,, ,, |
| 2.9.26 | 40 | Irregular | 15 | ,, ,, |
| 4.9.26 | 42 | ,, | 1 | ,, ,, |
| 6.9.26 | 44 | ,, | 10 | ,, ,, |
| 7.9.26 | 45 | ,, | 80 | ,, ,, |
| 8.9.26 | 46 | ,, | 60 | ,, ,, |
| 9.9.26 | 47 | ,, | 26 | ,, ,, |
| 12.9.26 | 50 | ,, | 16 | Condition improving |
| 13.9.26 | 51 | Normal | 3 | ,, ,, |
| 14.9.26 | 52 | ,, | 0 | ,, ,, |
| 15.9.26 | 53 | ,, | 0 | ,, ,, |
| 16.9 26 | 54 | ,, | 3 | ,, ,, |
| 17.9.26 | 55 | ,, | 12 | ,, ,, |
| 18.9.26 | 56 | Elevated | 30 | Very hot weather |
| 19.9.26 | 57 | Irregular | 31 | —— |
| 20.9.26 | 58 | ,, | 32 | Condition improving |
| 21.9.26 | 59 | ,, | 33 | ,, ,, |
| 22.9.26 | 60 | ,, | 34 | ,, ,, |
| 23.9.26 | 61 | ,, | 35 | ,, ,, |
| 24 9.26 | 62 | ,, | 36 | ,, ,, |
| 25.9.26 | 63 | ,, | 37 | Treated—P.A.T. [14.10.26 |
| 26.9.26 | 64 | Normal | — | No parasites seen until |
| 14.10.26 | 82 | ,, | 1 | —— |
| 25 10.26 | 93 | Irregular | 3 | Condition still improving |
| 26.10.26 | 94 | ,, | 3 | —— |
| 27.10.26 | 95 | ,, | 18 | —— |
| 8.11.26 | 107 | ,, | 6 | —— |
| 19.11.26 | 118 | Normal | 0 | Re-inoculated. Blood of infected sheep No. 473 |
| 10.12 26 | 139 | ,, | 1 | No parasites seen before this date |
| 9.2.27 | 200 | ,, | 2 | —— |
| 10 2.27 | 201 | ,, | 1 | No parasites seen after thi date until 1.5.28 |
| 27.3.28 | 583 | ,, | 0 | Re-inoculated. Blood of ra 733—heavily infected wit exalted strain of *T. congolens* |
| 1.5.28 | 645 | ,, | 0 | No parasites seen since inoculation (27.3.28), in spite o frequent search |

# Ploughing by Tractor.

By A. W. V. Crawley, M.E., F.G.S., Macheke.

Many enquiries are received from farmers who, having acquired a tractor, want to know the best and most economical way of ploughing their lands. Without a personal knowledge of the lands in question the enquiry is often a very difficult one to answer. It is hoped that the following short article may be useful to the beginner; the older user will have solved his own particular problems and know much more about it than these brief notes can tell him. The beginner, particularly if much new land is being ploughed, will often be very disappointed and somewhat disheartened the first season he uses a tractor. It only requires a little practice and experience to be successful, and once through the first season, very few will ever want to go back to the old-time and labour-wasting methods.

To the experienced tractor farmer the shape, lie of the land, soil conditions and the crops to be grown are the main points that determine how the land should be ploughed. The tractor demonstrator usually demonstrates ploughing by laying out a long, narrow strip with the shortest possible headlands to impress the buyer with a low fuel consumption and the time taken to plough an acre. The farmer is sometimes advised to have long and comparatively narrow lands for tractor farming. This would be all right for the first ploughing, but when cross-ploughing and the various tillage operations are needed the farmer finds that what he saved on the long side is lost on the short one, and that in the long run lands that are square or nearly so will be most economically worked by tractor. Some of us had lands laid out before the advent of the tractor in Rhodesia, and find ourselves at a disadvantage unless we can manage to square up our lands.

For the sake of economy the main thing with tractor ploughing is to avoid as much as possible travelling with the plough out of the ground. This means that headlands should only be wide enough to allow for easy turning, and that the stretch of land being ploughed should not be too wide. The novice is advised, if the headland is bounded by a fence or line of trees, to have a fairly wide headland till he becomes more accustomed to handling both tractor and the plough controls; if he has trouble with either, the plough may not come out quickly enough to save running into the fence or trees. For example, the Fordson in the hands of an expert only requires a headland of 18 or 20 feet, whilst the novice would do better with one of 24 to 28 feet. Whilst not always convenient, it will generally be found better to start ploughing a land from the centre instead of from one side. In ploughing the first stretch start with a back furrow or ridge in the centre and turn all furrows towards the centre. The novice starting at the side invariably finds that he gets an awkward shaped bit of land to plough out when reaching the centre, and to finish this means a lot of turning on the ploughed ground, and generally results in a very ragged appearance of the land, with a crooked open furrow in the middle. The expert obviates all this by taking care to straighten his furrow whilst he still has enough unploughed ground left in the centre to run on. Ploughing from the centre on the first stretch leaves both sides with unploughed ground to manœuvre on if any straightening is required. The second stretch can be ploughed from the centre or the sides. The novice is advised to start in the centre, as this gives him one unploughed side to straighten up on, and the ploughed side of the first stretch will act as a guide to keep that side straight.

Straightness of furrow being so essential, a little time and care spent in marking off the ground is well worth while. In ploughing newly cleaned lands it is generally advisable to have wider headlands and also to have the stretches as wide as possible. Endeavour to remove all the obstructions, such as stumps, boulders and roots, as they are met with. Leaving them in means trouble and loss of time next ploughing. When cross-ploughing has to be done it is always an economy in fuel,

oil and time to use wheel aids. Extension cleats with most tractors are better than extension wheels, and are cheapest to buy as well as to use. Owing to the cost of fuel and oil many farmers, in order to economise on these, try various methods of ploughing to avoid the cost of fuel and the time used in turning at headlands. The main object aimed at is to have the plough always in the ground doing useful work whilst the tractor is running. Sometimes the object is to dispense with open furrows and ridges. Ploughing right round the field from the outside is one method used. The novice mostly starts by going completely round with his first furrow, and then finds that the furrows at the corners are too wide, too shallow and not well turned over. Much of this can be obviated by ploughing a few furrows in one corner to produce a gradual curve, then plough out the other corners in the same way. Sketch No. 1 shows one of the best methods. The advantage of this method is that no measuring or marking out is required. The disadvantage is that it leaves a portion in the centre which can only be ploughed out by running over ground already ploughed, and that it is liable to leave a hollow in the centre of the land.

Sketch No. 2 shows another method which entails rather careful measurement at first. Once well done, and using permanent marks such as iron pegs or old piping at the eight points shown, the field can always be ploughed either from the centre, up and down or crosswise, as desired, and will require no more measurements for future years. The centre pegs are lifted out to allow of the passage of cultivators or other implements, and then at once replaced. This system leaves the ground practically level without open furrows or ridges, and at no time do the tractor and plough have to run on ploughed ground. It of course leaves the corners round instead of square, but it is surprising how sharp an experienced operator can make the corners, so that there is very little ploughing required to square the corners. It has been claimed that these methods eliminate nearly 15 per cent. in time and fuel consumed in turning at the ends.

These two systems have been taken advantage of to introduce various mechanical appliances to enable the tractor to do a considerable amount of ploughing without a driver

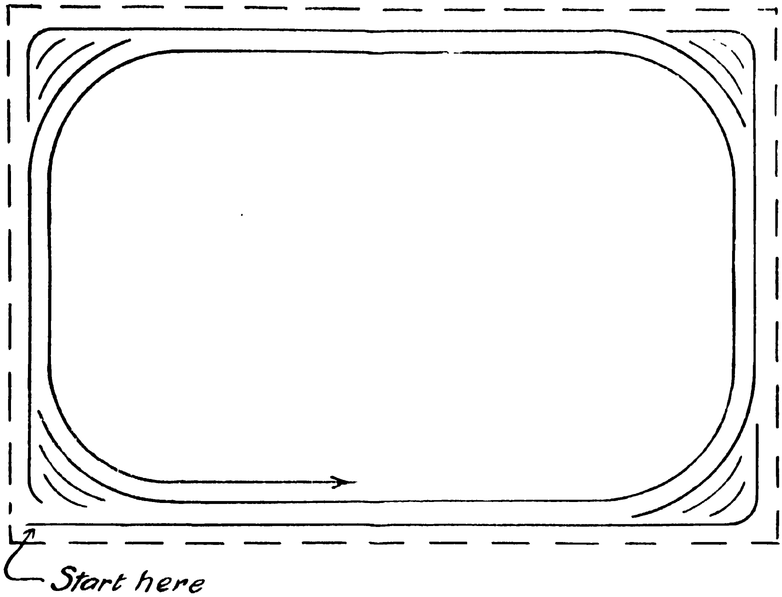



Fig. 1.

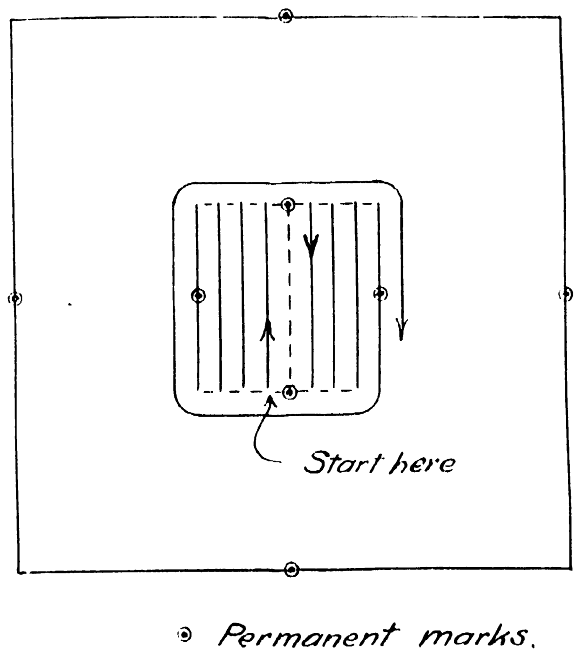



Fig. 2.

in attendance at all. With these attachments it is claimed that the tractor will continue to run and guide itself till the fuel supply is exhausted. The arrangement is generally some form of guide or pilot attached to the front of the tractor. This guide runs in the furrow and is held in place by pressure against the furrow wall. As long as it keeps in the furrow the tractor and plough continue to follow. Should obstructions force the guide from the furrow the ignition is automatically cut off and the tractor stops. I have made enquiries concerning these attachments to find one that would be likely to suit our Rhodesian soils and conditions, and hope shortly to be able to experiment with one. Investigations amongst users give some remarkable evidence in their favour. One enthusiast states that he went to bed, and in the morning found that the tractor had ploughed several acres and only stopped because the fuel was exhausted. Some farmers apparently leave the tractor ploughing and go away to other jobs, only returning when the tractor stops.

It may interest your readers to know that very interesting developments are taking place in America with regard to tillage tools for tractors. Having perfected the harvester combine, experiments are being carried out, with the aid of tractor experts, to produce a plough combine. Advantage is being taken of the tractor power take-off to run a rotatory device at the back of each plough bottom as the plough is being drawn by the tractor. This device pulverises the furrow slice, cuts up all surface vegetation, such as green manure crops and even old maize stalks. All the cut stuff is thoroughly mixed and incorporated with the soil, leaving a perfect seed bed without the need of any other tillage operations whatever. I understand that these machines will be mostly made for the medium-powered two or three-furrow capacity tractors, owing to the fact that so many farmers are using two or more medium-sized tractors in place of one large tractor.

From experiments already made in Rhodesia the use of two medium tractors in place of a large one has proved a success and confirms the opinion expressed in this journal some time ago—that the medium-sized light-weight tractor is the most generally useful and the most economical for our soils and conditions.

# Soil Erosion.

*(Continued.)*

By P. H. Haviland, B.Sc. (Eng.), Acting Irrigation Engineer.

## PROTECTION OF CULTIVATED LANDS.

Having described the methods by which the general veld erosion may be prevented, it is now necessary to deal with the erosion or denudation of cultivated lands. In order to prevent this it is absolutely essential that money be spent on the necessary works. Mention of expense, it is feared, will harden the hearts of many farmers, but a study of the economic side of the matter should relieve their minds of the idea that it is anything but an economic business investment. The "contour ridging" of cultivated lands, which is described further on, entails an expenditure of some 10s. per acre. In many cases in practice the figure per acre has been less than this. An amount of 10s. per acre is not high for anti-erosion works, and the increased yield from lands suitably protected will pay for this expenditure in six to seven years, and the value of the farm will be considerably increased.

Sound investments result in financial stability. *Money spent on anti-erosion works is money invested wisely.*

It must be borne in mind that the greater the volume of water flowing over the land and the greater the concentration of flow, the greater will be the erosion.

The results of unchecked erosion are:—

1. Formation of channels through the land, commencing as small wash-outs and later developing into unsightly gullies, with the consequent disappearance of soil.

2. The leaching out from the soil of chemical salts necessary for successful propagation of crops.
3. Disappearance of the humus in the soil and continual appearance of fresh sub-soil on the surface of the land.

This sub-soil never has time to gain the properties needful for the growing of crops, as it annually disappears and a lower stratum of earth is exposed.

These results may all be classed together thus:—

The inability of the soil to produce crops and the resultant depreciation of the value of the land. This immediately raises the question of protection against soil washing or denudation.

The problem to be solved may be divided into two heads:—

(a) prevention of large volumes of storm water from passing over the land;

(b) the prevention of an accelerated run-off, due to slope of land and increasing volume of water.

The question of protection is one which requires a great deal of thought and experience, and the methods recommended are based to a very great extent on practical experience.

**Storm Drains.**—Before measures can be adopted to prevent the denudation or washing off of the soil on cultivated lands by the water falling on the lands themselves, steps must be taken to prevent the access on to the land of storm water from outside areas. The only effective method of doing this is by the construction of storm water drains of adequate size at the heads and sides of all lands. The fault to be found with most farmers is that they almost invariably under-estimate the intensity of run-off of storm water after rain. A rainfall of, say, 2 ins. in $1\frac{1}{2}$ hours, which is not exceptional, and in fact has occurred a number of times during past wet seasons, could produce a run-off of 300 cusecs or 1,900 gallons per second per square mile of catchment very easily. Therefore storm drains capable of dealing with this amount of water are necessary.

Assume that two storm drains are constructed to carry off the water from one square mile or 640 acres of catchment, and that these are properly graded to a fall of 1 in 400, the size of each to deal with 150 cusecs would have to be 8 ft. 9 ins. wide at the bottom and 10 ft. 9 ins. wide at the top, with a depth of 2 ft.; if now we had to drain a catchment of two square miles, drains almost twice the capacity would have to be constructed.

These assumed figures are not in any way out of the ordinary; in fact, intensities of rainfall up to 4½ ins. in 1½ hours have been experienced. Further, the percentage of run-off from the hills in granite areas is very often so high as to account for a run-off up to 400 cusecs per square mile of catchment.

These figures should serve to show the absolute necessity for constructing what may be considered large storm drains.

The construction of a drain which will not carry off the normal run-off is wasted labour, time and money. The consequences are disastrous to the lands which the drains were originally intended to protect. An overflow takes place, the drain bursts and a large volume of water concentrated into one stream pours down the land, and a gulley is immediately formed which it is extremely difficult to prevent from growing in size.

*Utilisation of Natural Water Courses.*—In order to reduce the strain on artificial storm drains, natural water courses should be made use of to a great extent. *These should not be ploughed up, and natural vegetation should be left undisturbed.* Admittedly, in appearance, it is very fine to see a large unbroken stretch of ploughed land, and further, in practice, ploughing over long distances is rather less costly on account of more rapid work being possible, but it is far better to sacrifice the few acres of land occupied by the natural water course than to go to the expense of constructing an abnormally large artificial drain.

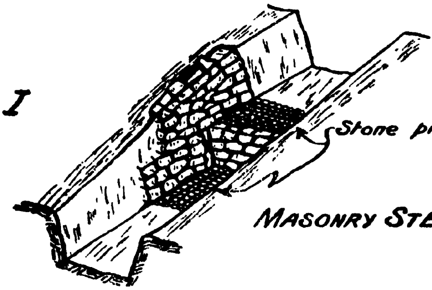
The natural water course does not erode to any noticeable extent if the volume of water passed down it does not exceed that which is carried off under natural conditions. This is the limiting factor for the use of natural water courses, unless additional artificial protection is resorted to.

*Grade and Sizes of Drains.*—The most suitable grade for storm drains is 1 in 300 or 1 in 400, depending on the type of soil in which they are constructed. In very rocky ground the grade might safely be increased to 1 in 100. Great care, however, must be taken to see that the drain does not scour to any marked degree. In carrying drains down steeply sloping land it is necessary to step down at intervals in order to preserve the grade. These steps must be protected. This may be done by means of stone pitching, masonry or concrete. Fig. I. shows a step in masonry.

An alternative to stepping down the drain by means of ordinary steps is by the construction of a "notched fall," as shown in Fig. V. This construction prevents the erosion of the drain bed immediately above the fall by maintaining a more constant water level in the stretch of drain above. The construction may be in brick, masonry or concrete. The "notched fall" shown in Fig. V. (a), (b) and (c) consists of two notches, but any number may be utilised, depending on the size of the drain. Fig. V. (d) shows the plan of a "notched fall" with four openings. The openings should have their corners rounded off in order to permit of easier water passage. It is advisable to corbel out the bottom lip of the notch so that the water may be evenly distributed. The water, after passing through the notch and over the corbelled lip, falls on a water cushion or stilling pool constructed in the bed of the lower reach of the drain. Where the total width of the "notched fall" is greater than the width of the drain, the side walls above must be splayed out as shown in Fig. V. (c).

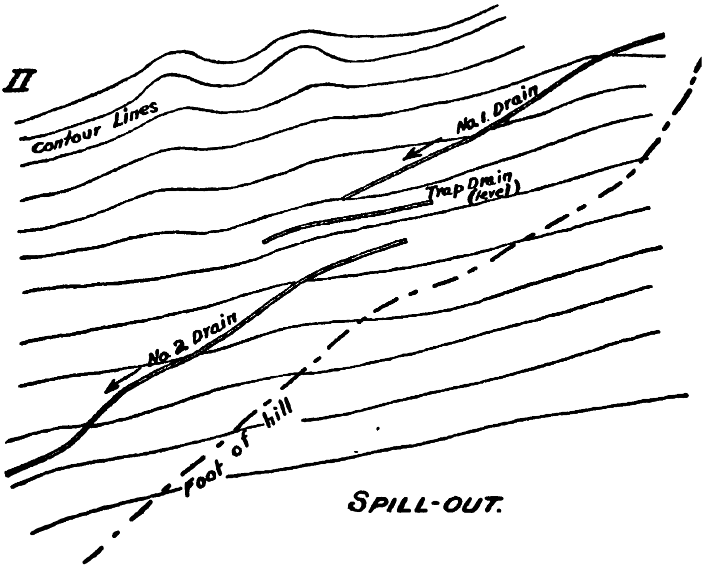
In running a drain round the foot of a hill the actual surface slope of the ground along the route is usually found to be very much greater than the proposed slope of the bed of the storm drain. In order to preserve the grade of the latter, steps again could be constructed, but there is another method of disposing of fall if the hill itself is sufficiently stony and hard. This disposal of fall is done by means of spill-outs. The drain is carried on a down grade till it commences to get away from the foot of the hill. The drain then terminates on natural ground level, and the water spilling out is picked up by a drain starting on a lower level. The end of the first length and the beginning of the

FIG. I



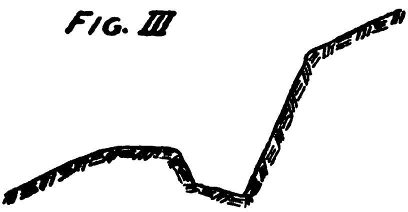

MASONRY STEP IN DRAIN.

FIG. II



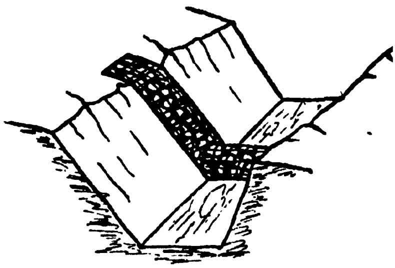

SPILL-OUT.

FIG. III



DRAIN WITH SLOPING BED.

FIG. IV



BOULDER-NET WORK IN DONGA.

second length must overlap. Further, an additional short length of level drain must be placed between the two so that it overlaps the end of the one drain and the beginning of the other. This short length serves as a trap for detritus and rubble carried in the drain itself. The velocity of the water spilling out from one drain is checked as the water reaches the trap drain, and all rubble is deposited, allowing storm water only to flow into the second length of drain. This method entails the making of longer drains, but on very steep ground it will be found more economical than the construction of steps at very short intervals. Fig. II. shows the spill-out method.

In all storm drains the bed of the drain should slope down towards the hill, in order to concentrate any scour taking place, on the side better able to stand it. Fig. III. explains this.

Table I. below gives the approximate dimensions of storm drains necessary for catchments of different sizes, and it must be emphasised very strongly that these dimensions are not on the large size.

In Table II. are set out the dimensions for "notched falls" constructed on storm drains of the sizes given in Table I. on a grade of 1 in 300. The letters refer to Fig. V.

## TABLE I.

| | Total area of catchment. | | Bed width. | Top width. | | Minimum depth. | |
|---|---|---|---|---|---|---|---|
| | Acres. | Square miles | | | | | |
| | | | Ft. | Ft. | Ins. | Ft. | Ins. |
| Grade of 1 in 300 | 80 | ⅛ | 4 | 5 | 9 | 1 | 9 |
| | 160 | ¼ | 6 | 7 | 10 | 1 | 10 |
| | 320 | ½ | 8 | 10 | 0 | 2 | 0 |
| | 640 | 1 | 12 | 14 | 0 | 2 | 0 |
| | 960 | 1½ | 14 | 16 | 2 | 2 | 2 |
| | 1,280 | 2 | 14 | 16 | 5 | 2 | 5 |
| Grade of 1 in 400 | 80 | ⅛ | 4 | 5 | 10 | 1 | 10 |
| | 160 | ¼ | 6 | 8 | 0 | 2 | 0 |
| | 320 | ½ | 9 | 11 | 0 | 2 | 0 |
| | 640 | 1 | 14 | 16 | 0 | 2 | 0 |
| | 960 | 1½ | 14 | 16 | 5 | 2 | 5 |
| | 1,280 | 2 | 14 | 16 | 9 | 2 | 9 |

## TABLE II.

| Size of drain | | | | Number of notches | Dimensions of notched falls | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bed width | | Depth | | | A | | B | | C | | D | | E | | F | | G | |
| Ft. | Ins. | Ft. | Ins. | | Ft. | Ins. | Ft. | Ins. | Ft. | Ins. | Ft | Ins. | Ft. | Ins. | Ft. | Ins. | Ft. | Ins. |
| 4 | 0 | 1 | 9 | 2 | 1 | 4 | 1 | 9 | 2 | 2½ | 1 | 0 | 0 | 6 | 0 | 9 | 1 | 0 |
| 6 | 0 | 1 | 10 | 3 | 1 | 5 | 1 | 10 | 2 | 1 | 1 | 0 | 0 | 6 | 0 | 9 | 1 | 0 |
| 8 | 0 | 2 | 0 | 4 | 1 | 5½ | 2 | 0 | 2 | 3 | 1 | 0 | 0 | 6 | 0 | 9 | 1 | 3 |
| 12 | 0 | 2 | 0 | 6 | 1 | 5½ | 2 | 0 | 2 | 3½ | 1 | 3 | 0 | 9 | 0 | 9 | 1 | 3 |
| 14 | 0 | 2 | 2 | 7 | 1 | 5½ | 2 | 2 | 2 | 5 | 1 | 3 | 0 | 9 | 0 | 9 | 1 | 6 |
| 14 | 0 | 2 | 5 | 7 | 1 | 6 | 2 | 5 | 2 | 3 | 1 | 3 | 0 | 9 | 0 | 9 | 1 | 6 |

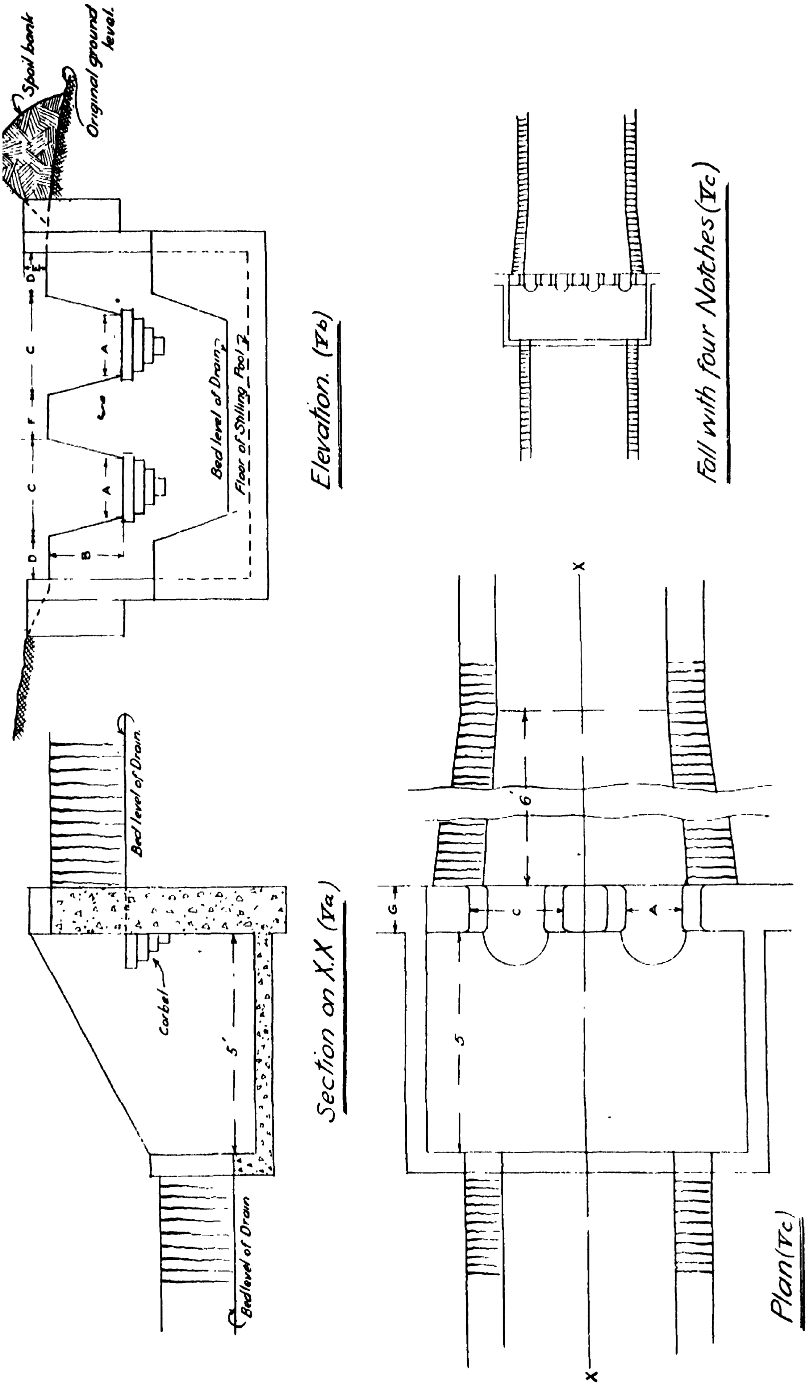

Spoil bank
Original ground level.
Bed level of Drain
Floor of Stilling Pool
Elevation. (Vb)
Bed level of Drain.
Corbel
5'
Bed level of Drain
Section on X.X (Va)
6'
5
Plan (Vc)
Fall with four Notches (Vc)
A
B
C
D
E
F
G
X

Fig. 5.

It is good practice to plant the spoil bank, formed of the excavated material placed on the lower side of the drain, with protective vegetation which will bind the earth and prevent it from being washed away. A suitable growth is "sisal," which will in time mat closely together and form a hedge.

Where storm drains cross gulleys leading from hills a strong construction is necessary. It is advisable to build small earth dams across such gulleys, discharging the water from the one section of drain into the basin so formed, and leading off the water again in the next section. In time these gulleys will become silted up to the level of the bed of the drain.

It is advisable to construct these small dams very carefully and to adopt the methods described below:—

The site must first be cleared of all roots, grass and organic matter, which must be thrown away. The earth used should be a good medium loam wherever possible, and should be placed in layers not more than 6 ins. thick. Each layer should be well consolidated by rolling, ramming or walking stock over it. Before the next layer is placed the surface of the work must be roughened by raking or some other method and then wetted. A tight junction between two consecutive layers must be obtained. The layers should be placed not dead horizontal but with a slight fall to the centre line of the embankment from each side.

For walls under 8 feet in height the top width must be at least 4 feet, and between 8 feet and 15 feet in height the top width must be at least 6 ft. The side slopes must not be steeper than 2 to 1, i.e., 1 ft. vertical to each 2 ft. horizontal. Care must be taken to effect a tight bond between the natural sides of the gulley being crossed and the artificial bank. The embankment should be planted with grass after completion.

The cheapest method of constructing storm drains is to first roughly plough them out, using as heavy a plough as possible, and then to finish off the work with hand labour. In some cases, of course, it will not be possible to utilise a plough, and hand labour only will have to be resorted to. Piece work will be found to be the most satisfactory allocation of work, and as a guide to the quantity of material which

can be excavated by an adult male native the following practical figures are given. The excavation is assumed to be in ordinary earth, and it should be realised that with a uniform depth the wider the drain the less will be the quantity excavated, owing to the fact that the spoil will have to be thrown further.

| Size of drain. | Length excavated per native per diem. | Quantity excavated per native per diem. |
|---|---|---|
| 4 ft. by 2 ft. deep | 13 ft. | 104 cub. ft. |
| 6 ,, 2 ,, | 8 ,, | 96 ,, |
| 10 ,, 2 ,, | 4 ,, | 80 ,, |
| 12 ,, 2 ,, | 3 ,, | 72 ,, |

Should the material excavated be gravel, the amount of excavation per native per diem must be reduced accordingly. A reduction of about 10 per cent. in this case should be reasonable, but practical experience will prove whether this is so.

In laying out the work it is best to supply the natives with sticks for measuring the correct depth to be excavated to. It will be found convenient to peg off both sides of the drain when allotting work. It is usually found that natives appreciate excavation work as a change to the usual routine, but it is unwise to keep them on this type of work for too long a period.

Where a drain changes direction easy curves must be constructed, and it will be found advantageous to increase the width of the drain slightly at these points. Storm drains, in a similar way to other forms of construction, must be inspected periodically and should be examined and cleaned out if necessary every year just before the advent of rains. It is most necessary that new drains should be examined during the first heavy fall of rain, and if not then, immediately after. It is better to inspect during the actual flow of water, as small undesirable deviations from the correct construction will be more obvious then.

The spoil or excavated material must be thrown on the lower side, and a berm or path should be left between the drain and the spoil bank.

*Remember, in all drain work, that if any doubt exists as to the correct size of drain, increase it beyond what may be thought sufficient, and never reduce it in size.*

(*To be continued.*)

# Investigations into "Collar-Rot" Disease of Citrus.

By J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad), Chief Botanist and Mycologist.

[*In the following article Mr. Hopkins describes certain original research work which he has carried out in this Colony as to the causes of collar-rot in citrus. He shows that this disease is not identical with the* mal-di-gomma *disease of the American citrus areas. In the last few years a new theory has been propounded by Dr. W. Small in Ceylon with regard to the parasitism of a fungus reported to cause root diseases of a very wide range of plants. It is this fungus, or one very closely related to it, which Mr. Hopkins has found causing one type of collar-rot of citrus in Southern Rhodesia. The technicalities of the subject have been omitted as far as possible, but a certain amount of mycological nomenclature has necessarily to be employed.—Ed., R.A.J.*]

Intermittently for the last two years investigations have been proceeding into certain obscure diseases of citrus in this Colony. Almost all the work has been confined to Washington Navel oranges budded on rough lemon stock. One of the commonest features of diseased trees was the cracking of the bark just above the bud union, so that the name collar-rot or *mal-di-gomma* was usually applied to describe a condition similar in many respects to that which is well known in the citrus-growing regions of America. There is, however, a very distinct difference between the Rhodesian disease and the latter, in that exudation of gum is in most cases entirely absent, although occasionally a small amount may be seen upon the exposed wood or bark; its presence is very rare. Another difference which need not be fully discussed here lies in the organisms which have been isolated

from the diseased regions. Many samples of material have been examined in this laboratory, and until recently a single fungus, a species of *Fusarium*, was always obtained in culture. This organism failed to produce the bark disease when inoculated into healthy trees, so therefore could not be held responsible. An examination of the roots of unhealthy trees failed to furnish any definite information, and it was not until the middle of last year that opportunity could be found for the writer to give his undivided attention to this investigation.

**Symptoms.**—The disease as it commonly occurs in Rhodesia is characterised by the thin appearance of the top of the tree, the production of narrow, often closely bunched, leaves which usually are yellow between the veins, die-back of twigs or branches and low cropping (Fig. 1). Occasionally a tree may produce a heavy crop of fruit which is small in size and of a coarse texture, making it quite unsuitable for export. Badly affected trees may be partly dead, usually upon one side, and the bark beneath the dead branches is cracked, the split sometimes extending some distance above the ground (Fig. 2) and occasionally continuing along one or more of the lower branches. The bark just above the bud union sloughs away, leaving the wood, which is usually of a light buff colour, exposed, and the rupture may extend for three-quarters of the diameter of the tree trunk.

The general symptoms of yellow areas on the leaves, die-back and low cropping suggest an unhealthy root system, since analyses of the soils in which trees were growing (made by the Chemistry Division of this Department) showed them to be very fertile and entirely suited to citrus culture. The complete scrutiny of the root system of an established orange tree, however, presents many difficulties, since only a cursory examination can be made unless the tree is very carefully uprooted. Within the last few months the writer has been able to make a thorough investigation of the roots of some 200 trees which were removed from the ground by a special method, causing little damage to the finer feeding roots and extremities of the laterals.

It soon became clear that yellowing of leaves and withering of twigs were but preliminary stages of the same disease which caused bark cracking and die-back of branches, with

Fig. 1.

Fig. 2.

Fig. 3.

the eventual death of the tree, and the fundamental cause was found to be a more or less diseased root system, which varied with the severity of the symptoms of the aerial portion of the plant. The wood of affected roots was of a dry, brittle nature and light in colour, while the bark formed a loose enclosing cylinder which broke away as a powder or in fine shreds on being handled. The inner layers of the bark were usually jet black, and sometimes remained adhering to the wood in the form of a black incrustation. The wood itself, although of a light buff or pinkish brown colour, was usually observed to contain a large number of small black bodies up to one-thirty-second of an inch in diameter, and numerous thin black lines (Fig. 6). It was also observed that the black bodies on the outside of the wood were a continuation in many cases of the black incrustation beneath the bark.

**Causal Agent.**—Microscopic examination showed these black bodies to be *sclerotia* or knotted masses of a fungus. The black lines and incrustation were also of a similar nature and corresponded very closely with Small's (1) description of a similar disease of *Grevillea robusta*, the Silky Oak, in Uganda. This fungus was named by Small *Rhizoctonia lamellifera*, and it is possible that the name may eventually be retained, although for technical reasons it is now supposed to be a strain of *Rhizoctonia bataticola* (which has been found on *Eucalyptus* spp. in Rhodesia), about which considerable controversy at present exists. A full discussion of the significance of the facts recorded in this article will be published elsewhere in the near future, but at the moment it is the writer's object to keep the farmers of this Colony informed of information obtained by this division.

Isolations were made from numerous pieces of material, and in all cases the same fungus has been obtained, usually quite pure, even from unsterilised fragments of wood teased from the centre of roots, large and small roots yielding alike. The important fact which needs to be borne in mind in view of the different opinions held with regard to the parasitism of this organism is that, except for the instances to be mentioned later, *Rhizoctonia* was obtained pure from diseased roots, which, it had to be admitted after the examination of many trees, were the cause of their unhealthy condition. In fact, almost every stage of disease could be found, and it

became increasingly obvious that the severity of the above-ground symptoms was directly proportional to the extent of infection by *Rhizoctonia*, which was also correlated with the absence of fibrous or feeding roots. Nematodes, closely resembling if not identical with the citrus nematode, *Tylenchulus semipenetrans*, were usually found infesting the fibrous roots and were probably responsible for their ultimate destruction; but the intensity of infestation always varied with the degree of infection of the lateral roots by *Rhizoctonia*, and the serious condition oi diseased trees could not be attributed to the agency of the former.

**Nature of "Collar-Rot."**—This affection was in most cases confined to the more unhealthy-looking trees, although a few instances could be found to the contrary. , Its appearance is shown in Fig. 2 upon a tree which contained many dead branches above the cracked bark. It should be noted that the bark is diseased only above the bud union, this being one of the differences from the American *mal-di-gomma;* also the absence of external gumming is apparent. All collar-rots associated with *Rhizoctonia* root disease which were examined by the writer were of this type.

The external appearance of the diseased bark was normal, but the inner face which had become exposed to the air was brown in colour and sometimes contained small deposits of gum. The exposed wood was of a light brown colour externally, but when cut into with a chisel, showed a grey discoloration. It was observed that this external wood was of an exceptionally hard texture, rendering cutting with any but a very sharp pen-knife a difficult operation. This could not be immediately accounted for, but on microscopic examination was found to be due to gum deposited in the outer layers of the wood and forming a thin sheath encircling the whole of the woody cylinder of the tree. This layer of gum was approximately one-sixteenth of an inch in thickness, and was surrounded by a sheath of light-coloured wood of an equal thickness. Thus the exposed surface of the tree showed no acute discoloration. For the better examination of these tissues the trunk was sawn across an inch or two above the bud union, and the transverse section, when smoothed, revealed quite clearly the two layers of light wood and gum. On the side of the tree where the bark had sloughed away

a grey discoloration extended into the wood for some distance beneath the gummy layer, and involved about one-third of the area of the cross-section. The remainder of the wood, however, appeared quite normal, except for the encircling rings of gum and light wood.

Microscopic examination of these various zones showed the grey wood to be invaded by a dark-coloured fungus, whilst occasionally very thin hyaline threads of another fungus could be seen. The light-coloured region was found to be composed of woody elements which were dead and had begun to break away from the main trunk. Sections of the interior of the separated bark showed some of this disintegrated wood still adhering to the inner surface. Hyphæ or threads of the dark-coloured fungus could also be seen in these sections. A similar examination was now made of the opposite side of the sawn trunk, where the bark appeared to be normal. Sections including bark, light wood, gummy layer and inner wood were made. The same condition of disintegrating wood in the outer layer was found to exist, but no evidence could be found of the presence of any micro-organism, either in stained or unstained sections or by culture methods. The natural inference to be drawn from these observations was that the bark disease was caused by a deposition of gum within the outer layers of the woody cylinder, and that the fungi observed in the exposed wood had established themselves subsequently to the cracking of the bark. The examination of many more trees affected by collar-rot bears out this hypothesis, and it has been found that in trees where the bark has become detached from the wood, but has not cracked, the gummy layer is present, but that no discoloration of the wood has taken place and no fungus is present. The commencement of the grey discoloration of the wood has in several instances been traced to the area immediately beneath a small split in the bark not exceeding one inch in length, and a fungus has been constantly isolated which is identical with the *Diplodia** of tea, rubber, etc. This grey wood frequently extends down into the large lateral roots, but rarely more than a few inches from the crown of the tree, and then only in roots which have been killed by

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* *Diplodia* = *Botryodiplodia theobromæ.*

*Rhizoctonia.* In the disease in question *Diplodia* has never been found to assume a role of primary importance, and its saprophytic or weakly parasitic nature is emphasised by its frequent presence in the dead bases of small branches which have at some time been broken. The limit of its penetration is confined to the stump and does not extend into the living limb from which the branch arose. The ultimate cause of bark disease lies in a sheath of gum which clogs the growing tissue of the tree between the wood and the bark, whilst the deposition of gum is almost certainly due to the improper functioning of the root system, due to infection by *Rhizoctonia.* That the plant reacts to the invasion of the fungus by the production of gum seems clear, since infected wood is always limited by a layer of this substance, and in the early stages of disease, gum may be found clogging the vessels of roots in advance of the invading organism. Microchemical tests show that this substance is in the nature of wound gum, which fact its location in the tissues would appear to substantiate. (See Figs. 4 and 5.)

Two other types of collar-rot distinct from each other have also been observed, but time has not been available for thorough investigation and comparison with that already described. Probably either of these is more common than that caused by *Rhizoctonia*, but there is reason to believe that heretofore all types of bark disease have been attributed by growers to the same causes. The writer has, however, observed three distinct origins. The first has been dealt with, the second results from water-logging and the third from too deep planting.

**Water-logging.**—In some respects the condition of trees planted in water-logged soil closely resembles that of those affected by *Rhizoctonia* root disease. In fact, the external symptoms are almost identical. The experience of the writer, however, is that the yellow appearance of the leaves of the former is more often due to concentric blotch rather than to chlorosis between the veins. Die-back of branches and cracking of bark are identical.

Water-logged trees usually show an abundance of fibrous roots close to the base of the trunk and extending for a short distance outwards. They are frequently confined to the top

Fig. 4.

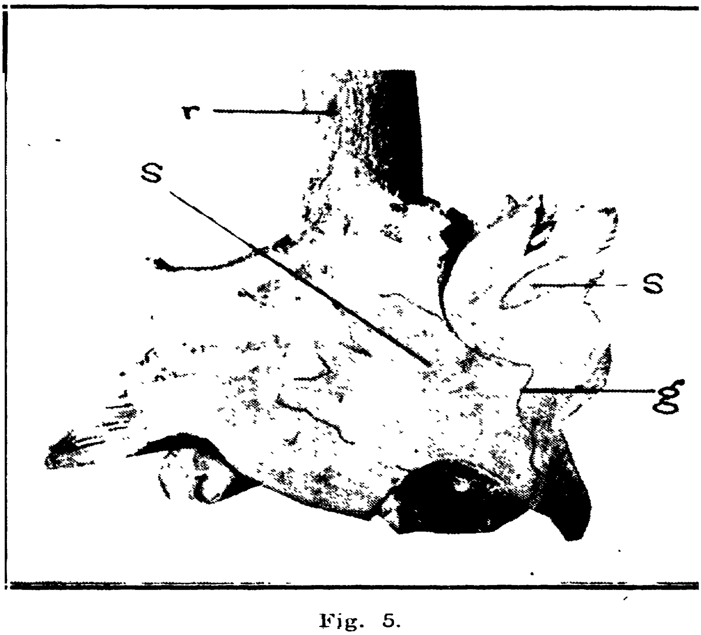
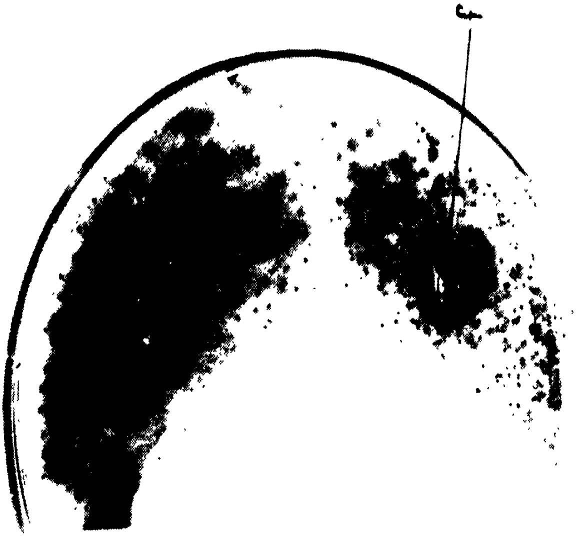
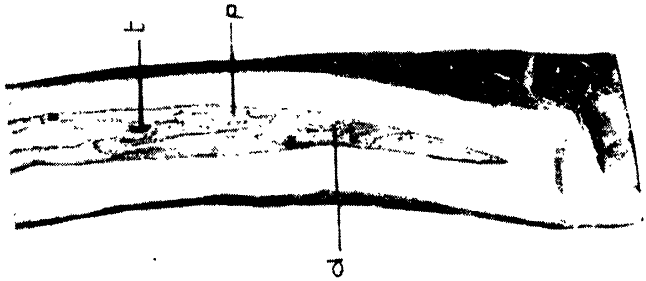
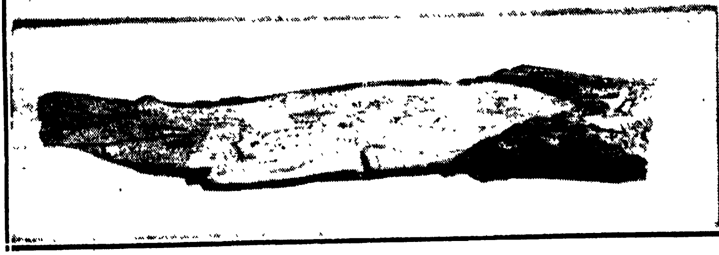



Fig. 5.







few inches of soil as a thick matting. Those farther away from the tree are usually infested by the citrus nematode, which is further evidence of the secondary nature of this pest. Most of the diseased lateral roots examined by the writer are affected by a dry rot, have light-coloured internal wood, which is usually hard and brittle, and are frequently devoid of bark, in which case the exterior of the wood is dark grey in colour and is coated by a mass of minute black spherical bodies which give the root a jet black appearance. Other roots may be light in colour and have a certain amount of bark, which is in shreds, enclosing the wood, whilst a third type closely resembles *Rhizoctonia* wood enclosed in a crumbling bark, beneath which is a jet black incrustation.

Investigation so far has revealed the presence of *Diplodia* almost completely invading these latter roots, and pycnidia or spore bodies of the fungus have been found imbedded in the loose bark. The black incrustation beneath the bark contains *Diplodia* hyphæ, and sections of the wood show aggregations of the hyphæ approximating to sclerotia. In none of the badly water-logged trees has *Rhizoctonia* yet been observed, but other wood-destroying fungi were frequently present. The fact, however, must not be lost sight of that these roots were in a more suitable condition for attack by a saprophytic or weakly parasitic fungus than by one more strongly parasitic.

Whatever the variation in the condition of the roots, very little difference is apparent on examination of the diseased collar. *Diplodia* is invariably present in the wood, producing the typical grey discoloration, and exactly the same condition of gumming is found. Uncracked bark has no grey wood beneath, while the beginning of infection occurs immediately under the smallest open wound.

**Deep Planting.**—Trees which have been planted with the bud union near or below the level of the ground frequently are affected by bark disease, which often results in their death. The type of decay is, however, usually different from that induced by abnormal condition of the root system. The bark is, as a rule, thinner than normal, and does not curl away from the trunk in a very pronounced manner. The whole diseased portion is darker in colour than the previously described collar-rot, and often extends below the bud union.

*Diplodia* has been found associated with this disease, and pycnidia of the fungus may sometimes be seen emerging from the bark. The etiology of the disease, however, has not been fully studied by the writer, but it would appear that this collar-rot is more closely related to the American disease than the other two types, at least as far as symptoms are concerned, especially as an exudation of gum sometimes accompanies the decay of bark.

**Contributing Conditions.**—Poor drainage and bad planting are obviously responsible for the last two bark rots, but such conditions do not prevail in the case of *Rhizoctonia* root disease. Unsuitable soil has been ruled out by chemical analysis and actual observation. As the trees were being grown under well controlled irrigation, the water factor does not appear to be involved. There is only one blot on the history of these trees, and that is rather unfavourable treatment for the first year after planting out. Whether the fungus established itself in the roots during this period or not it is impossible to determine at so late a date, but this possibility must not be overlooked and can only be tested by experiment over a long period of years. At all events, if this were so it is shown by this investigation that subsequent good cultivation and regular application of manure and fertilisers will not restore to permanent good health affected trees.

**Control.**—The methods to be adopted for control of these diseases will depend upon the causal agents. Inarching, root pruning and disinfection, root aeration and drainage may be included among the measures which may possibly succeed.

For the *Rhizoctonia* disease where soil conditions have been improved, inarching, together with the cutting away and destruction of large diseased laterals, holds out possibilities of success. All diseased wood should be scraped away and all wounds disinfected with some solution such as corrosive sublimate (1 part to 1,000 parts water) and then covered over with tar or grafting wax. In view of the fact that internal gummosis of the trunk plays such an important part in the causation of disease, the removal of diseased roots would appear to be essential. However, considerable experimentation is required in order to evolve suitable control measures,

since a permanent cure by the above methods is up to the present a rarity in this Colony. One important point should be borne in mind, and that is to take as much care as possible of newly planted trees and not labour under the misapprehension that good cultivation and manuring are detrimental to their future well-being.

The remedy for water-logging is the digging of drains or removal of pan by dynamiting and such means, according to local conditions, but the obvious way to combat this type of disease is to avoid unsuitable sites for planting. Inarching, root pruning, root aeration by removal of surface soil are likely to be useless unless drainage has been effected, but might subsequently serve to invigorate trees which had received a setback, if not too great.

The writer has known of success in the recovery of trees suffering from too deep planting by the removal of surface soil to the level of the top large lateral roots, but only if carried out before the disease has progressed too far.

The whole question of root and bark diseases of citrus needs thorough investigation, and it is hoped that further work in the direction of devising control measures may be continued in the near future.

## SUMMARY.


1. Three types of collar-rot or *mal-di-gomma* disease of citrus are described.
2. An account is given of a collar-rot resulting from root disease caused by a species of *Rhizoctonia*.
3. The parasitic nature of the *Rhizoctonia* is discussed in some detail and compared with the fungus known as *Diplodia*.
4. Decay of bark above the bud union has been shown to be due to the deposition of gum in the outer regions of the woody cylinder, and probably the cambium.
5. Collar-rots resulting from water-logging of roots and from too deep planting are described.
6. Control measures are suggested for the three types of disease.
7. The incomplete nature of present knowledge regarding root and bark diseases of citrus is emphasised.

## REFERENCE.

1. Small, W.: "A *Rhizoctonia* causing root disease in Uganda." *Trans. Brit. Myc. Soc.*, IX., 3, 1924.

## EXPLANATION OF PLATES.

Fig. 1.—Badly diseased tree, showing dead branches and small bunched leaves.

Fig. 2.—Typical "collar-rot."

Fig. 3.—*Rhizoctonia* infected root entering crown of tree, showing sclerotia, lines in wood and portions of black incrustation. (Bark shaved away with pen-knife.)

Fig. 4.—*Rhizoctonia* sclerotia and lines in broken section of tap root immediately below crown of tree.

Fig. 5.—Cross-section of crown of tree, showing islands of sclerotia-containing wood (s) limited by a barrier of gum (g) and diseased root (r).

Fig. 6.—Typical *Rhizoctonia* infected lateral root. (Planed away to show sclerotia and lines.) About half natural size.

Fig. 7.—Dual infection of root by *Rhizoctonia* and *Diplodia*. (p) *Rhizoctonia* lines; (d) discoloration due to *Diplodia;* (t) part of white ant tunnel. About half natural size.

Fig. 8.—Original isolation of *Rhizoctonia*. (f) Fragment of diseased root.

# Farm Forest Practice in Southern Rhodesia.

*Issued by the Forest Service.*

## I. THE RAISING OF PLANTING STOCK.

The following article on nursery practice is intended to meet the requirements of the farmer and general tree planter who find it more suitable, for reasons of economy in transport and expense, to raise their own transplants than to purchase stock raised by nurserymen.

**Source of Seed.**—Seed may be purchased from Government Forest Nurseries as quoted in Departmental price lists, or from nurserymen of standing. If, however, trees of the species it is desired to establish are thriving in the locality, it may be cheaper to collect seed from them. Only well formed mother trees should be selected and, *ceteris paribus*, trees bearing excessively heavy crops of seed should be avoided, as their condition may indicate ill-health or non-suitability to the locality.

Branchlets carrying seed vessels or cones should be picked and piled on a sheet of canvas or some large open vessel, and placed in the sun in a spot protected from wind. In the course of one to four days the vessels will open and free the seed. Shaking and turning over the pile will accelerate liberation. The seed is finally collected from the threshing floor and, if not to be sown immediately, should be stored in a cool, dry place.

**Quantity of Seed for Planting Requirements.**—Ultimately, to produce sufficient plants to set out one acre with a planting distance of 6 ft. x 6 ft., the quantity of seed sown should be 1 oz. for *Eucalyptus* spp. and 2 to 3 ozs. for pines, cypresses, callitris, cedrela, etc.

**Time of Sowing.**—Eucalypt seed may be sown during September to mid-December for planting out during the same rainy season.

Cedrela toona should be sown fresh immediately after ripening in November-December for planting out during the same rainy season.

Seed of pines, cypresses and callitris may be sown during February, March and April for planting out in the following rainy season.

**Preparation of Seed Beds.**—The nursery should be in a locality near permanent water, protected from winds and carrying a well drained soil. Due regard should be paid to the distance of the planting area and, to facilitate supervision, the homestead.

The soil should be well broken up and reduced to a fine tilth. No sticks, stones or clods should be left in the upper 3 ins. of soil. Sterilising by burning and fertilising are not necessary. A light sandy loam is suitable for a temporary nursery. For a permanent nursery a mixture of heavier soil and leaf mould may be added to the end that the soil will be both friable and retentive of moisture.

When the soil has been well tilled, beds 3 ft. 6 ins. in width, of any suitable length, and about 20 ins. apart, should be marked off, levelled and pressed down to ensure a smooth surface. Plate 1 shows a suitable implement to smooth the surface of the beds. It consists of a board nailed to a handle.

**Sowing the Seed.**—Seed may be sown broadcast, the density of sowing being dependent on the desired subsequent treatment. If it is intended to prick out seedlings into tins or trays, 3 to 4 ozs. of eucalypt seed and 6 to 8 ozs. of conifer seed may be sown to the square yard. The easiest way to gauge the density of sowing is to aim at a condition where slightly more seed is visible on the seed bed than soil. If the seedlings are to be planted out direct from the seed beds a much lighter sowing—about 1 oz. to every 10 to 20 sq. yds. —should be carried out, dependent on the size of the seed. Eucalypts should be sown from mid-October onwards. In planting out direct, line sowing may be adopted. Seed is sprinkled along the surface of the bed in lines about 6 ins.

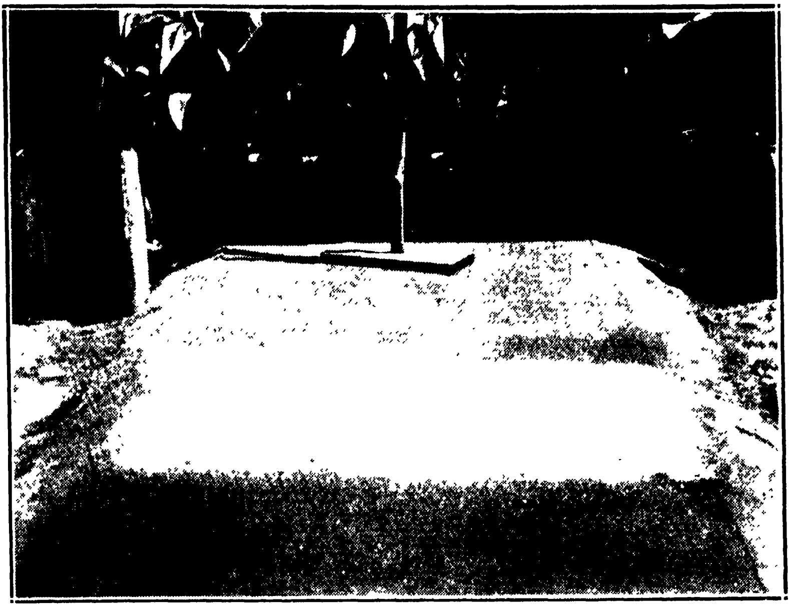


Plate No. 1.—Method of making seed beds. Note board for levelling the beds. Seed sown on bed in foreground; seeds covered with fine sand beyond; part of bed beyond not sown.

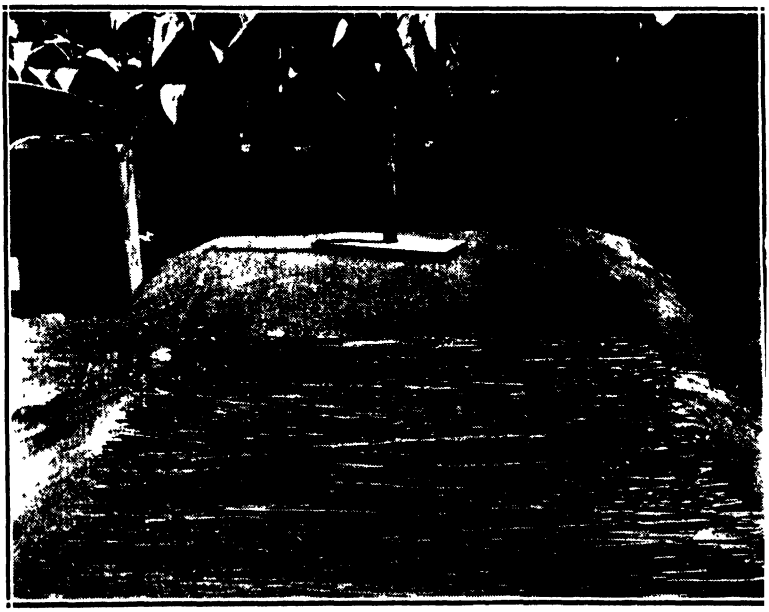


Plate No. 2. Method of covering beds with grass. Well combed grass should be used.

Plate No. 3. Method of raising trees in lines in the beds (cutting the tap roots).

Plate No. 4.—Preparation of soil for tins. Putting soil through the sieve to mix and remove lumps.

apart. This system naturally requires more space than broadcast sowing, but it has the advantage that thinning, weeding and root pruning operations are facilitated.

Broadcast sowing by hand gives good results in most instances. With very fine seed it may be sometimes advisable to mix the seed with fine sand to ensure even distribution. The sowing of eucalypt seed through a watering can is neither necessary nor advisable. When the seed has been sown it should be covered with a layer—the depth equal to the breadth of the seed—of sand or other soil which has previously been put through a sieve of fine mesh. The beds should now be covered with well combed grass of sufficient thickness so that the soil cannot be seen. See Plate 2. As the grass comes in direct contact with the seed it is important to have it well cleaned, as otherwise white ants may be attracted to the beds. A good watering should now be given to the seeds through the grass.

**Care of Seed Beds.**—Watering of the beds should be carried out once or twice daily. The weather conditions prevalent over the germination period will indicate the frequency of watering desirable. Success lies in keeping the soil moist though not sodden. Germination should take place within four to eight days in the case of eucalypts and cedrela and ten to fourteen days or more for pines, cypresses and other conifers.

When germination is complete most of the grass should be removed, a very light covering being left for a few days to enable the young seedlings to harden off. All the grass should then be removed. If the grass is left on too long the seedlings will tend to spindle and will be useless for pricking out. In the case of beds sown for plants to be planted out direct to the field, the seedlings should be thinned out where they are too dense, leaving about 80 seedlings to the square foot. Thinning should be done by cutting out undesirable plants. Pulling is bad practice, as it damages the roots of the plants which are to remain. Weeding should be carried out whenever necessary, and waterings must also be frequent.

With eucalypts, when the young plants have from six to ten leaves, root pruning should be resorted to at intervals

of about three weeks to encourage the formation of a fibrous root system. The operation is carried out by inserting a long-bladed knife or sharp spade 4 to 5 ins. below the surface. With other species root pruning should start when the plants are $1\frac{1}{2}$ to 2 ins. high. Line sowings are more easily treated by this operation. See Plate 3.

**Pricking Out into Tins, Trays or Beds.**—Petrol tins cut longitudinally in half or wooden boxes approximating them in size are most commonly used for the reception of pricked out plants. A few holes to facilitate drainage are punched in the bottoms of the tins, which are then filled almost to the top with, preferably, previously prepared soil. Such prepared soil might consist of three parts heavy loam, three parts sand and one part well rotted vegetable matter. This should be well mixed, if necessary, sieved (see Plate 4), watered and thrown into a heap until required. The object is to obtain a soil which will bind slightly and not give off moisture too rapidly.

The soil in the tins is then watered, and holes, equidistant and 25 to 30 per tin, made either with a pointed stick alone or with the assistance of a dibbling board, of a size to fit the tin, with holes about half an inch in diameter spaced as required. A dibbling stick is inserted through these holes into the soil. The tins are now ready for the pricked out seedlings.

The operation of pricking out is best carried out in the shade. It is well previously to construct a simple shade house made of poles, with a loose roof of branches carrying sufficient foliage to allow plenty of light within the structure, at the same time appreciably lessening the intensity of the sun's rays. A portion of the shed should be fitted up with a rough table and have complete shade overhead. The tins containing the soil are placed on the table ready for the seedlings. Seedlings are ready for pricking out when they are about $1\frac{1}{2}$ ins. high, and in the case of eucalypts, when they have two to three pairs of leaves. With a spade, a clod of earth carrying sufficient seedlings to fill two or three tins is dug out and carried quickly to the table in the pricking out shed. Great care should be taken to expose the roots as little as possible to the air. With a pointed dibbling stick the seedlings are removed from the clod of

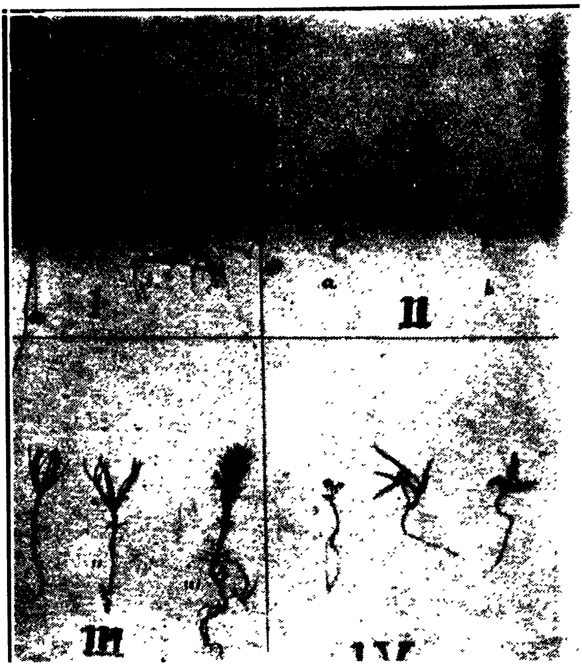



Plate No. 5.

No. I. (a) Eucalypt grown in seed bed for planting direct; tap roots not cut.

(b) Eucalypt grown in seed bed to plant direct from beds: grown in lines and tap root cut.

No. II. (a) A good plant for pricking into tins.

(b) Plant with tap root shortened, ready for pricking into tins.

No. III. (i.) Pine seedling at right stage for pricking out into tins

(ii.) Pine seedling with tap root shortened.

(iii.) What happens if tap root is not cut back: roots are twisted up and plants will not thrive.

No. IV. Plants that are bent and twisted to be discarded.

**Plate No. 6.—Method of cleaning off roots from the bottom of tins**

earth one by one and quickly examined. If the tap root is too long and obviously out of proportion to the rest of the plant it should be nipped off with the thumb and forefinger, leaving a root which is half as long again as the stem. If the tap root is badly bent, or the seedling otherwise ill-shaped or unhealthy, the plant should be thrown away. The plant, having been examined and found suitable, is inserted into the prepared hole, and the soil is pressed against it from the side with the dibbling stick in such a manner that the root is not bent and that there is no air pocket at the base of the hole. The seedling should be inserted no deeper than it stood in the nursery bed, *i.e.*, at the collar. (See Plate 5.) A seedling pricked out with a bent tap root or with the collar deep in the soil starts life with a handicap from which it will never recover. It simply means waste of money, labour, time and a gap in the plantation.

As each tin is filled with plants it is placed in the partial shade of the other part of the shed and watered through a fine rose. Subsequent waterings need only be given when the soil shows signs of drying out. After a week or ten days in the partial shade the tins are placed out in the open sunlight, where the plants are allowed to harden off.

**Pricking out into Beds.**—In favoured localities of high rainfall planting out transplants with open roots is often carried out. In this case the sowing and pricking out operations are reversed, in that seed is sown in tins and the seedlings subsequently pricked out into beds. The same treatment and method of preparing beds are followed as described above. Holes are prepared in the beds with a dibbling stick through a dibbling board, and the tins containing the seed are carried to the beds, where pricking out is done as before.

**Care of Plants Prior to Planting Out.**—Plants which have been pricked out into tins or beds or which have been left in the nursery beds for direct planting should be watered frequently, dead plants should be replaced and weeding carried out. If planting rains are long delayed and the young plants show a tendency to too rapid growth, this growth should be checked by watering very sparingly. The plants should in effect be made to struggle. The leaves, if the plants are given sufficiently short rations of water, will

take on a bluish or brownish colour. This need cause no alarm, as hardy plants will result. On the other hand, this will be the sign that a watering must be given soon in order to keep the young plants alive. If the planting of trees contained in tins is held over for any length of time, periodical inspections should be made by turning over the tins and pruning off all the roots which have come through the drainage holes. (See Plate 6.)

**Conclusion.**—Trees are living things subject to ailments like human beings. In the youthful stages they require care and attention, and the amount they receive is reflected in their subsequent growth. Success or failure rests with the controlling hand; in other words, all operations should be carried out with understanding and never without adequate, interested supervision.

## A Tribute from Northern Rhodesia.

*"Kindly note that I am leaving the above address this week and would like you to hold my copy of the 'Rhodesia Agricultural Journal' until I can give you a new address. I value my copy of the Journal and do not wish to lose any issues."*

# Outbreak of Army Worm in Southern Rhodesia.

## MEASURES WHICH MAY BE ADOPTED IN CASE OF RECURRENCE.

By the DIVISION OF ENTOMOLOGY.

The Rhodesian "Army Worm" (*Laphygma exempta*, Wlk.), or "Army Mystery Worm" as it is sometimes termed in the South African Union, has put in an appearance this season in numbers in several districts in Mashonaland and Matabeleland. Considerable damage to maize is reported. The last big outbreak of this pest was in January and February, 1926.

This caterpillar is the young stage of an inconspicuous night flying moth, and, it may be mentioned, has no connection with the migratory white butterflies which commonly fly steadily in a south-westerly direction for days on end during the early part of the wet season. The eggs are laid in clumps on the food plants and are covered with down from the parent moth. They hatch in a few days (minimum three), and the caterpillars feed up rapidly. The period of development has not been ascertained accurately in Southern Rhodesia, but it is probably about three weeks in the summer. When fully fed the caterpillars enter the soil and change to the pupa stage, from which the bulk of the moths emerge in a fortnight or less in the summer. In confinement moths have commenced to appear from 40 days after the eggs were laid. Outbreaks rarely last for more than about ten days after the caterpillars are noticed.

The cause of the sporadic outbreaks of this pest is not fully understood, but from observations made in this Colony it is only possible to deduce that the moths after emergence from the pupæ (chrysalis) commonly fly great distances before laying eggs. In any case it is certain that moths may breed out in large numbers in a given area and no second outbreak of caterpillars appear in the same area. So far no two outbreaks on an extensive scale have occurred in the Colony in any one season, but recorded outbreaks range from December to April. The name "Mystery Worm" given to the pest in the South African Union is certainly justified.

The caterpillars have many enemies, amongst the most effective of which are the storks. Parasites and disease tend to reduce them greatly.

The most favoured food plants of the Army Worm seem to be *grasses*, including such cultivated grasses as maize and other cereals. *Ground nuts* and *potatoes* have, however, been reported as severely attacked. *Cotton* is rarely damaged to a serious extent, although after weeds have been eaten off the caterpillars may be found on cotton plants. Young *sunflowers* have also been reported as attacked.

Remedial measures are not always easy or even possible. Spraying the herbage with a solution of arsenite of soda will destroy the caterpillars effectively, and by this method invasion of maize lands can be prevented. When only part of a maize crop is heavily infested it may pay to sacrifice it in order to prevent the pest from spreading. The plants and any weeds may be sprayed with the poison, or a brush drag might be tried in emergency to destroy the insects mechanically. Another method of arresting spread is to strew green grass or other green stuff of the same family across the line of march and to spray it as frequently as found necessary with the poison. This method may also be used in combination with a furrow, the bait being strewed at the bottom. The furrow should be made as steep as possible on the side towards the unattacked maize. It can be opened up with the plough as deeply as possible and shaped out by dragging a log along it.

Spraying a few rows of plants around the infested portion with arsenate of lead (powder), 1 lb. in 25 gallons of water, may be tried, but the treatment is expensive on a large scale.

Arsenate of lead will not injure the plants. Where the whole crop is more or less infested by the time the insect is noticed the position is very difficult indeed. If a maize crop is sufficiently far advanced for the plants to be deprived of some of their lower leaves without serious injury, a method sometimes adopted is to dip these in the poison and distribute them between the rows. Otherwise green grass or bran can be used if available. In any case it is necessary to send labourers through the lands to shake the caterpillars off the growing plants. The promptest measures are, however, necessary to save the crops, and full success has not always been reported from baiting between the rows in the way described. When the plants are sufficiently small, brush drags might be tried on the growing crop, but the farmer is advised to proceed with caution and to make sure that the procedure will not do too much damage to the crop. It is necessary, of course, to wait until the plants have been slightly wilted or rendered less turgid by the heat of the sun before subjecting them to this rough treatment. A brush drag is readily made by fastening bushes to a cross pole.

The most convenient solution of arsenite of soda to use is the Government locust poison diluted with 200 times its bulk in water. Dry arsenite of soda should be used at 1 lb. to 20 gallons of water. In the South African Union and elsewhere the addition of sugar or molasses to the solution is recommended. Two lbs. of sugar or 2 quarts of molasses to each 16 gallons of dilute solution has been recommended. This addition is of doubtful advantage, and is certainly not necessary when the spray is applied over infested veld.

Needless to say stock should be kept away from sprayed veld, from green stuff or other material dipped in the solution, and from vessels containing the solution.

# Bulawayo Municipal Experiment Station.

## ANNUAL REPORT FOR 1927-28.

By S. D. Timson, M.C., Dip.Agric.

The total rainfall for the season was 14.62 ins., of which only about 1½ ins. fell after 19th January. All crops germinated and grew well, and in fact, up to that date, promised to be better than in any previous year. The severe drought then began and lasted until the end of the season.

Those crops which gave the best results, namely, the legumes, kaffir corn and Sudan grass, were planted in November or early December, and so got the full benefit of such rains as fell. Sudan grass planted on 22nd November and reaped on 23rd January gave an exceptionally heavy yield of 15,136 lbs. green fodder per acre, thus demonstrating its ability to withstand drought to a remarkable degree. During the growing period only 10 ins. of rain fell. Kaffir corn also gave a heavy yield of 16,770 lbs. green fodder per acre. This crop also upheld its reputation as a drought-resister, as it received only 12 ins. of rain during the growing period.

Five plots of velvet beans yielded an average of 7,532 lbs. of green fodder per acre; two plots of dolichos beans averaged 11,260 lbs. of green fodder per acre, and five plots of cow peas gave an average yield of 5,961 lbs. of green fodder per acre. It will be seen that dolichos beans gave the heaviest yield of green fodder, the better plots returning a yield of 13,500 lbs. per acre. The above results go to show that all these three leguminous crops are

admirably suited to areas of low rainfall. Sunn hemp also grew well and gave a fair yield of seed at the rate of 306 lbs. per acre.

The silage crops which were not planted till the beginning of January not unnaturally failed almost entirely. Irish potatoes gave a yield of 26 bags per acre, which must be considered good under the severe drought conditions obtaining for the greater part of the growing season. Canadian wedge pea and soya beans gave good yields of grain—476 lbs. and 384 lbs. per acre respectively.

In the maize variety trials the early maturing flint varieties, Yellow Flint and American White Flint, outyielded the Flat White Dent varieties, as was to be expected, for the long-season white varieties had no chance during the exceptional drought after 19th January. The flint varieties yielded 5¼ bags per acre against 1½ bags per acre from the white dent varieties.

The new variety of velvet beans tried this year, Tracey's Early Black, gave an outstanding yield of seed, agreeing with results obtained at Salisbury. This variety shows promise of being a very suitable crop for Matabeleland when grown for grain, but the White Stingless variety considerably out-yields it for fodder and hay.

The yields of maize in the rotation and other maize trials were so low as not to be considered worth recording. On this station the maize stalks, after removal of the cobs, are baled each year when dry and used to supplement the feeding of the oxen during the dry weather. The remarks of Mr. Babb, Town Ranger, on this point are of general interest. He says: "Out of 40 acres of maize planted I had enough baled maize stalks to carry 42 head of oxen through the ploughing season and for other commonage work during the winter without any other feed, except, of course, ordinary grazing."

# The Poultry Industry.

## CHOOSING A MALE BIRD.

By A. Little, Poultry Expert.

Now that the young cockerels are developing it behoves the breeder to be very careful what he selects for next year's breeding season.

There is hardly any point in connection with poultry culture of more importance than the selection of the stock male birds and the proper care of them. They are the foundation stones upon which is built stamina or weakness in their progeny. They account for failure or success during next breeding season, according to their faults or good qualities.

One infusion of wrong blood or one fault on the male side, however slight, will tend to obliterate from a strain good qualities that have taken years of careful breeding to fix.

A case in point as an example is the following:—A breeder of my acquaintance had taken years to build up a strain of prolific layers of large eggs. He introduced fresh blood by means of a cockerel at a high price from a very prominent breeder whose egg records were excellent. The following year practically all the pullets sired by this cockerel were laying smaller eggs than those from the owner's own strain. The result was that the money paid for the cockerel and the time, labour and expense in rearing the pullets from him were wasted. This proves how careful a breeder should be in selecting his breeding stock, especially his male birds. We nevertheless hear of poultry keepers buying male birds without knowing one iota of their

qualities or bad points, also others using the first one they can catch out of a number running about their premises.

Late hatched, immature cockerels are no good. No one has ever seen a wise gardener propagate plants or trees from immature stocks, and no poultry breeder has ever been known to transform, by the use of good food and most careful management, the progeny of an immature sire into robust adults.

We get in the early hatched cockerels what we can never get in the late hatched one, and that is maturity coupled with maximum stamina.

The cockerels for next season should have a big range. To rely for breeding in limited quarters on cockerels that have been bred in limited quarters is to run the risk of getting chicks that will be hard to rear. A poor cockerel can originate a multitude of troubles during the breeding season.

Cockerels, when they go into the breeding pen, should be as active as possible and as hard as nails. There should be no sign of flabbiness about them; they should run, if possible, on free range (at any rate have the exercise they require in a large run).

As a rule far too much mash food is given to cockerels for breeding; grain should form 75 per cent. of the food, the balance in the form of mash being used to enable the birds to get the necessary allowance of animal protein required.

When going through the cockerels, selection and very vigorous selection should be the motto; eliminate all with any signs of faults, especially those lacking in vigour, stamina and constitution or any whose mothers have been poor layers. The chief aim of the poultry breeder should be to produce and retain the transmission of good laying qualities, vigour and type.

# Maize.

*(We feel sure that the following informative article which appeared in "The Economist" of 24th November will be read with interest by maize growers. The upward trend of prices in 1928 as shown in the table reproduced has continued into the new year, quotations for South African yellow maize on 11th January being 43s. 6d. for February-March shipment. We notice from Broomhall's Corn Trade News that the stocks of maize in the United Kingdom in December, 1928, amounted to 590,000 quarters, compared with 730,000 quarters a year previously.—Ed., R.A.J.)*

One of the most interesting commodity developments of the past few years is the increasing use of maize in the principal European countries. This development is one of the causes of the high price of maize on the market to-day, where the best grades demand a higher price than that asked for low-grade wheat. The upward movement in prices has been relatively steady since 1925, affected only by crop variations. In 1913 maize was roughly about half the price of wheat, and while crop variations, as in the past two years, have their natural effect, the upward movement culminating in to-day's high prices points to a steadily increased demand, borne out by the figures of imports of European consuming countries. The following record of prices of maize at London and Liverpool for the past few years, with their comparison with prices in 1913, shows the steadiness of advance, particularly in the last twelve months:—

PRICE OF MAIZE (MONTHLY AVERAGE).

*(La Plata Yellow, in Shillings, per Quarter of 480 lbs.)*

| Month. | 1913. | 1925. | 1926. | 1927. | 1928. |
|---|---|---|---|---|---|
| Aug. ... ... | 22 8 | 40 4 | 30 7 | 32 5 | 36 1 |
| Sept. ... ... | 23 8 | 37 4 | 29 9 | 31 10 | 35 9 |
| Oct. ... ... ... | 21 9 | 34 2 | 30 3 | 31 9 | 39 3 |
| Nov. ... ... | 21 8 | 35 9 | 31 1 | 32 1 | ... |
| Dec. ... ... | 23 0 | 36 3 | 29 7 | 34 10 | ... |

The price for La Plata maize at 19th November was as high as 42s. 3d., while No. 5 Manitoba wheat was quoted as low as 40s. For many years now world production of maize has exceeded that of wheat, and the following table shows the relative production of maize and wheat during the period in which the price of maize has made its steady advance:—

### COMPARISON OF WORLD PRODUCTION, MAIZE AND WHEAT.

(*In Quarters of* 480 *lbs.* 000's *omitted.*)

| | 1923. | 1924. | 1925. | 1926. | 1927. |
|---|---|---|---|---|---|
| Maize | 467,850 | 402,480 | 472,520 | 452,120 | 460,160 |
| Wheat | 432,910 | 384,870 | 413,750 | 418,930 | 431,920 |

On these figures average world production of maize works out for the period shown at roughly 450 million quarters annually, as compared with 416 million quarters of wheat. Russian production of both wheat and maize has been omitted, owing to the difficulty of obtaining authentic figures.

The effect of increased demand in advancing the price of maize is intensified by the fact which is evident from the above figures that world production shows no signs of any great increase, although in the case of one or two producing countries great advances in production have been made, and will doubtless, in view of the trend in price, continue to be made.

Although maize is a very valuable foodstuff, its principal use is for stock feeding, to which has been added a greatly increased demand for poultry feeding in Europe during the past few years. As a foodstuff South Africa alone requires some 700,000 tons annually to feed its native population with "mealies," while in the United States, apart from the large consumption by the negro population of the south, maize is a popular food among the farm population of the Middle West, in the form of "corn" bread and cakes, and as hominy, and is used generally all over the country in many other forms as breakfast foods of the patent "flaked" variety. Corn starch, or corn flour, as it is called in England, is a valuable maize product for invalid use.

To such uses must be added the many others which modern chemistry has devised, whereby maize can be adapted to serve not only as a direct foodstuff, but in the processes of manufacture of many articles as diverse in their human uses as starch, syrups, toffee, mineral waters, condensed milk, brewers' sugar, baby foods, chewing gum, adhesives, leather, carpets and rope. A valuable oil is also expressed from the maize germ, which is used in increasing quantities for soap-making, and, when refined, has a wide market for use in the preparation of salad dressings, mayonnaise, etc. The amount of corn oil used in such ways in 1926 exceeded 120,000,000 lbs.

While such minor uses, which are said to absorb some 4 per cent. of the total of the United States' enormous maize production, are not generally employed in Europe, every effort is being made to make them known and to popularise them.

So far as maize production is concerned, the United States are far and away the greatest producers, as they are the greatest users, the American corn crop (the word maize is not used in America) being roughly each year equal to two-thirds of the world's total production, of which less than 1 per cent. has been exported in the form of grain during recent years. The following table shows the principal producing countries, and it must be borne in mind that American exports being comparatively small, it is upon the other producing countries shown that Europe has to depend for its increasing needs.

## MAIZE PRODUCTION: PRINCIPAL PRODUCING COUNTRIES.

(*In Quarters of* 480 *lbs.* 000's *omitted.*)

| | 1923. | 1924. | 1925. | 1926. | 1927. |
|---|---|---|---|---|---|
| Utd. States | 356,350 | 269,820 | 338,450 | 308,600 | 325,100 |
| Argentina | 20,580 | 32,500 | 21,700 | 32,610 | 37,430 |
| S. Africa ... | 6,250 | 4,000 | 8,540 | 3,770 | 7,900 |
| Danube countries— | | | | | |
| Hungary | 5,750 | 8,650 | 10,260 | 8,930 | 8,100 |
| Jugoslavia | 9,890 | 17,430 | 17,410 | 15,650 | 8,940 |
| Bulgaria | 3,130 | 3,190 | 3,280 | 3,390 | 2,410 |
| Roumania | 17,660 | 18,140 | 19,100 | 27,900 | 17,000 |
| Italy ... ... | 10,410 | 12,330 | 12,830 | 13,780 | 10,300 |

Although American production has doubled itself during the past 50 years, the bulk of the maize crop has always been kept within the country, as it has been found more profitable to consume and export maize in the form of indirect products, such as cattle, beef and pork. This tendency has increased as the area laid down to maize by the settlement and development of the great Middle West has progressed, so that whereas in 1878, with half to-day's production, the United States exported 6.3 per cent. of its maize crop in the form of grain, the actual exports since 1923 have not equalled 1 per cent. of the total maize harvested.

Europe is therefore dependent for its main supply of maize upon other countries. Its principal sources of supply are the Danube countries (Roumania, Bulgaria, Jugoslavia and Hungary) and Argentina, where maize cultivation has made remarkable strides, the Argentine exports having doubled themselves during the past five years, incidentally providing a cargo of increasing value to British and other shipping to the River Plate. Argentina differs from most producing countries in exporting a greater proportion of its annual crop, other producing countries following the lead of the United States in retaining the bulk of their production for home consumption. Thus Italy, a comparatively large producer, judged by European standards, consumes the whole of her output, and even finds it necessary to import further supplies each year to meet her needs. The following table shows the principal European importing countries taking the bulk of the world's exportable supplies:

## EUROPEAN IMPORTS OF MAIZE.

*(In Quarters of 480 lbs. 000's omitted.)*

| | 1923. | 1924. | 1925. | 1926. | 1927. |
|---|---|---|---|---|---|
| Great Britain ... | 8,969 | 8,816 | 6,451 | 7,446 | 9,788 |
| Germany ... ... ... | 1,164 | 1,799 | 2,560 | 3,235 | 9,753 |
| France ... ... ... ... | 3,083 | 3,108 | 2,700 | 3,060 | 3,690 |
| Denmark ... ... ... | 1,558 | 1,960 | 2,180 | 1,768 | 3,940 |
| Belgium ... ... ... | 1,855 | 2,220 | 2,134 | 2,870 | 3,660 |
| Holland ... ... ... ... | 3,261 | 3,941 | 4,040 | 4,730 | 6,370 |

The greatly increased imports during 1927 will be readily marked in the above table, and these were un-

doubtedly influenced by the abundant crops available from the Danube countries and the Argentine, where production was high, with a reciprocal drop in prices which induced heavy purchases.

Since then, however, the amount available for European consumption has shown a decrease, owing to the crop in the Danube countries being affected by bad weather conditions, which have resulted in a reduction of some 20 per cent. in production during the past two years. This year's American crop is said to be large—probably the largest since 1923, an increased acreage having been sown; but, judging from the experience of the past 20 years, American needs may also have expanded sufficiently to absorb it. In 1925, which was a peak year of production, only 0.8 per cent. of America's total crop was exported as grain. One reason for the immense absorption of maize in America may be found in the fact that pork consumption there accounts for 46 per cent. of the meat eaten, while the per capita consumption of meat and lard during 1926 is given officially as:—Pork, 65.71 lbs.; beef, 63.4 lbs.; lard, 13.65 lbs. Such figures, bearing in mind that the population to which they apply is some 110 millions, go far to explain the great home consumption of maize in the United States. Whether or not the advancing European demand, with its steady rise in price, will tempt a greater proportion of this year's large American crop to be exported remains to be seen.—(*The Economist*, 24th Nov., 1928.)

# Review.

*"The Scientific Principles of Plant Protection."*

By Hubert Martin.

Edward Arnold & Co., London, 1928, pp. xii. and 316; 21s.

"Entomology and mycology are concerned with the organisms responsible for injury and disease among crop plants, but the problems of the control of crop pests—plant protection—involve not only biological but equally important chemical and physical studies. Indeed, so extensive has the field now become that co-operation between the entomologist or mycologist and the chemist, physicist or plant physiologist is rapidly becoming recognised as the most economical and successful means of progress." So states the author in his preface, and it is from this point of view that he has brought together and arranged a mass of information which formerly was scattered throughout the agricultural literature of many countries.

This book, which deals with the fundamental principles of methods of control of plant pests, many of which have arisen empirically, will be welcomed by workers in all branches of agriculture dealing with the raising of crops. Particularly does the author stress the belated recognition of the importance of the intensive study of pests and diseases, illustrating his remarks by quoting an estimate of total annual loss from this source in Great Britain amounting to not less than £15,000,000 to £20,000,000. The present expenditure on agricultural research and advisory work comes to rather more than one halfpenny per pound sterling of the value of the crops raised, and "would be a good investment even if all the money were devoted to the study of plant diseases."

The questions of plant resistance and the influence of external factors are dealt with at some length, whilst considerable space is given to discussions of the chemistry and fungicidal action of the sulphur and copper groups of sprays, stomach poisons, particularly the arsenicals, and contact insecticides. Chapters are reserved for the consideration of fumigants, weed-killers and seed and soil treatment. At the end of the book the more modern methods of biological control and the use of insect traps, particularly trap crops, are described, whilst the final chapter deals with the elimination of centres and vectors of infection.

The system of references at the end of the discussion on each subject is to be commended, and a glossary of abbreviations used in the references is most helpful. Indices of subjects and authors are appended, whilst a foreword by Sir Daniel Hall, K.C.B., D.Sc., LL.D., F.R.S., is also included.

The book is an admirable review of the weapons at present available for use in the never-ending campaign against pests of cultivated crops.

J. C. H.

# Movements of New Settlers.

The following new settlers arrived in the Colony during the month of December, 1928:—

Capt. E. C. Kalshoven.—Arrived from the Union on 5th October, 1928, on tour of inspection.

Mr. and Mrs. Colin West.—Arrived from Great Britain on 13th December, 1928, and have acquired land near Bembesi.

S. R. Jarvie.—Arrived from Great Britain on 14th December, 1928, and proceeded to Mr. Ramsay, Wild Duck Farm, Nyabira, for a period of training.

R. O. C. Townsend.—Arrived from Great Britain on 14th December, 1928, and proceeded to Mr. C. C. Townsend, Lowdale Farm, Salisbury.

W. L. Crawley.—Arrived from Northern Rhodesia on 17th December, 1928, on tour of inspection.

S. J. R. Hayman.—Arrived from Great Britain on 21st December, 1928, and proceeded to Mr. R. Somers Taylor, Talford, Sinoia, for a period of training.

M. K. Howell.—Arrived from Great Britain on 21st December, 1928, and is visiting friends.

Capt. and Mrs. Despard, son and daughter.—Arrived from Union and proceeded to Gwebi Government Farm for a period of training.

R. E. Stewart.—Arrived from India on 24th December, 1928, on a tour of inspection.

Mrs. E. Brown and daughter.—Arrived from Great Britain on 25th December, 1928, and staying with friends in Salisbury.

C. A. Moore.—Arrived from Great Britain on 30th December, 1928, and proceeded to Mr. Meikle, Charter Estate, Marshbrook, for a period of training.

# Southern Rhodesia Veterinary Report.

## November, 1928.

### AFRICAN COAST FEVER.

Two cases occurred on the infected farm Morgenson, Melsetter district.

### TRYPANOSOMIASIS.

In the Melsetter district a Police horse was found to be affected with this disease. The source of infection and method of transmission are so far unexplainable. Although tsetse fly has never been located in the district, a slight mortality from trypanosomiasis occurs from time to time in cattle. During the month one ox died in the southern section of the district.

### TUBERCULOSIS.

Post-mortem examination on an imported Devon bull on a farm in Salisbury district revealed lesions of tuberculosis.

No reaction to the tuberculin test occurred amongst cattle tested on importation.

### MALLEIN TEST.

No reactions amongst the equines tested on importation.

### IMPORTATIONS.

From the Union of South Africa: Bulls, 10; cows, 12; heifers, 19; horses, 15; mules, 24; donkeys, 242; sheep, 2,114; goats, 298.

### EXPORTATIONS.

Cattle.—To Union of South Africa for local consumption, 334. To Belgian Congo: Slaughter, 1,096.

Miscellaneous.—To Northern Rhodesia: Sheep, 88; goats, 25. To Belgian Congo: Sheep, 60; pigs, 262. To Union of South Africa: Pigs, 88; horses, 2. To Portuguese East Africa: Goats, 30; sheep, 30.

## COLD STORAGE EXPORTS TO BELGIAN CONGO.

Carcases, beef, 179; sheep, 38; goats, 11; pigs, 40; ox tails, 174; ox heads, 64; ox hearts, 248; ox livers, 145; ox tongues, 292; ox feet, 158; ox tripes, 89; sheep's tongues, 43; sheep's trotters, 77; sheep's heads, 2; sheep's livers, 81; sheep's hearts, 87; sheep's brains, 50; pigs' livers, 19; pigs' plucks, 42; game heads, 36.

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# December, 1928.

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## AFRICAN COAST FEVER.

No fresh outbreaks and no cases of disease at any of the existing centres of infection.

## ANTHRAX.

An outbreak occurred in the western section of the Mazoe district. Three head of cattle died. All in-contact animals were vaccinated.

## CONTAGIOUS OPHTHALMIA OF CATTLE.

Prevalent in the Salisbury, Hartley and Melsetter districts.

## MYIASIS (SCREW WORM) OF CATTLE.

Prevalent in the Melsetter, Salisbury, Mrewa, Macheke and Bindura areas.

## HEARTWATER.

Some mortality in cattle occurred in the Gwanda district. An ox died at the railway station, Bulawayo, after arrival from Gwaai. Post-mortem examination showed heartwater.

## IMPORTATIONS.

From the Union of South Africa: Bulls, 18; cows and calves, 24; heifers, 52; horses, 15; mules, 16; sheep, 2,145; goats, 354; pigs, 36.

## EXPORTATIONS.

Cattle.—To Union of South Africa for local consumption, 47. To Belgian Congo: Slaughter, 1,921. To Northern Rhodesia: Breeding, 12. To Portuguese East Africa: Slaughter, 12.

Miscellaneous.—To Northern Rhodesia: Sheep, 144; goats, 96. To Belgian Congo: Pigs, 183. To Union of South Africa: Pigs, 25.

## COLD STORAGE EXPORTS TO BELGIAN CONGO.

Carcases: Oxen, 278½; pigs, 61; sheep, 147; goats, 52; calves, 9. Ox livers, 150; ox tongues, 105; ox hearts, 164; ox tails, 171; ox cheeks, 122; sheep plucks, 13; calves' hearts, 15; clean tripes, 42.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

# Southern Rhodesia Weather Bureau.

## DECEMBER, 1928.

**Pressure.**—The mean pressure for the month was low, varying from 0.038 in. below normal at Melsetter to 0.014 in. below normal at Livingstone. The tracks of highs and lows were not well defined during December. A low moved up the east coast on the 5th and affected Rhodesian pressure in the north-east until the 13th. During the middle of the month several lows passed along the south coast. On the 17th a low appeared on the north-west coast; this low moved inland on the 21st and remained in evidence throughout the month. Extensions of this low affected Matabeleland for a considerable period, and were accompanied by heavy rain in that area. Highs maintained the tendency shown early in the season to lie off Beira for considerable periods. The first high moved up the east coast and was off Beira on the 3rd and 4th; the second also moved up the east coast and affected Beira from the 15th to the 28th, being reinforced by further highs which moved up on the 20th and 24th. The outstanding characters of the month were the extensions of the equatorial low into Matabeleland in conjunction with high pressure on the east coast.

**Temperature.**—The mean monthly temperature was about normal, varying from 2.7° F. above normal at Tuli to 2.2° F. below normal at Gatooma.

The mean maximum temperature was low, varying from 3.9° F. below normal at Gatooma to 5.3° F. above normal at Tuli.

The mean minimum temperatures were high, varying from 2.7° F. above normal at Enkeldoorn to 0.5° F. below normal at Sinoia.

The relative humidity was generally above normal.

**Rain.**—The mean rainfall recorded during the month was 7.8 ins., as compared with a normal of 5.5 ins. The distribution was as follows:—

| | December, 1928. | Normal, December. |
|---|---|---|
| Zone A ... ... ... ... ... | 7.21 | 5.55 |
| Zone B ... ... ... ... ... | 5.27 | 4.20 |
| Zone C ... ... ... ... ... | 7.54 | 5.91 |
| Zone D ... ... ... ... ... | 9.11 | 6.60 |
| Zone E ... ... ... ... ... | 10.13 | 5.77 |
| Zone F ... ... ... ... ... | 16.26 | 7.93 |

The rainfall was in excess in all zones. The seasonal total to date amounts to 11 ins., as compared with the normal of 9.8 ins.

**Rain Periods.**—Rain fell in two periods during the month. The first period lasted from the 1st to the 15th and the second from the 22nd to the end of the month. Showers fell in northern Mashonaland on the 1st and 2nd and were general from the 3rd to the 8th, developing into general rains from the 9th to the 11th; from the 12th to the 15th the showers decreased and were confined to Mashonaland. Numerous showers were reported from the 22nd to the 24th, developing into general rains on the 25th and 26th. Heavy showers were general in the south up to the 30th, accompanied by showers in the north. On the 31st showers were fairly general.

# RAINFALL.

| Station. | 1928. Nov. | 1928. Dec. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone A.:** | | | | |
| Bubi— | | | | |
| Bembesi Railway ... | 2.18 | 7.43 | 9.61 | 8.19 |
| Glenarton ... | 2.78 | ... | ... | 7.18 |
| Inyati ... | 2.20 | 8.91 | 11.17 | 8.59 |
| Judsonia ... | 1.61 | 7.12 | 8.73 | n.s. |
| Martha Farm ... | 1.86 | 5.00 | 6.86 | 7.44 |
| Nduba Farm ... | 1.55 | 12.53 | 14.00 | n.s. |
| Shangani Estate ... | 2.08 | 5.31 | 7.39 | 9.38 |
| Bulalima-Mangwe— | | | | |
| Centenary ... | 3.41 | ... | ... | n.s. |
| Kalaka ... | 3.69 | 4.10 | 7.79 | 7.67 |
| Riverbank ... | 2.59 | 4.84 | 7.46 | 8.94 |
| Solusi Mission ... | 2.82 | 3.65 | 6.47 | 8.02 |
| Bulawayo— | | | | |
| Fairview Farm ... | 4.05 | 7.62 | 11.67 | 8.49 |
| Keendale ... | 3.14 | ... | ... | 7.97 |
| Lower Rangemore ... | ... | 9.56 | ... | 8.33 |
| Observatory ... | 3.40 | 7.77 | 11.18 | 9.36 |
| Waterworks ... | 3.88 | 7.04 | 10.92 | 8.56 |
| Gwelo— | | | | |
| Brockenhurst .. | 3.69 | 9.97 | 13.99 | n.s. |
| Frogmore ... | 2.75 | 11.37 | 14.41 | n.s. |
| Gwelo Gaol ... | 4.24 | 9.71 | 14.21 | 10.10 |
| Riversdale Estate ... | 1.74 | 6.65 | 8 52 | 9.56 |
| Somerset Estate ... | 2.61 | 5.94 | 8.65 | 10.07 |
| Insiza— | | | | |
| Orangedale ... | 1.69 | ... | ... | 9.49 |
| Shangani ... | 1.88 | 9.13 | 11.05 | 8.67 |
| Thornville ... | 3.61 | 9.24 | 12.86 | 8.74 |
| Nyamandhlovu— | | | | |
| Gwaai Reserve ... | 5.77 | 5.08 | 10.89 | 6.79 |
| Gwaai Siding ... | 4.27 | 6.81 | 11.09 | n.s. |
| Naseby ... | 3.16 | 5.16 | 8.34 | 8.44 |
| Nyamandhlovu Railway ... | 3.69 | 8.67 | 12.36 | 8.49 |
| Sebungwe— | | | | |
| Gokwe ... | 3.69 | ... | ... | 10.07 |
| Umzingwane— | | | | |
| Springs ... | 3.64 | 6.91 | 10.56 | 8.75 |
| Wankie— | | | | |
| Dett ... | 3.77 | 8.13 | 11.90 | 6.27 |
| Matetsi Railway ... | 1.83 | 5.74 | 7.60 | 9.23 |
| Ngamo Railway ... | 4.40 | 5.12 | 9.61 | 7.78 |
| Rosslyn ... | 1.16 | ... | ... | n.s. |
| Sukumi ... | 2.45 | 7.83 | 10.51 | 7.24 |
| Tom's Farm ... | 1.27 | 9.09 | 10.56 | n.s. |
| Victoria Falls ... | 1.61 | 5.44 | 6.62 | n.s. |
| Victoria Falls Railway ... | 1.29 | 5.88 | 7.50 | 10.01 |
| Wankie Hospital ... | 1.56 | ... | ... | 8.00 |

## RAINFALL—*(Continued)*.

| STATION. | | 1928. Nov. | 1928. Dec. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|---|
| ZONE B.: | | | | | |
| Belingwe— | | | | | |
| Bickwell | ... | 1.56 | 7.45 | 9.01 | 7.54 |
| Sovelele | ... | ... | ... | ... | 4.86 |
| Tamba | ... | 2 31 | ... | ... | 5 82 |
| Wedza | ... | ... | ... | ... | 6.80 |
| Bulalima-Mangwe— | | | | | |
| Bruwapeg | ... | 2.33 | 2.55 | 5.11 | 6.82 |
| Edwinton | ... | 6.14 | 8.77 | 14.91 | 8.55 |
| Empandeni | ... | 4.23 | ... | ... | 7.73 |
| Fallowfields | ... | 3.33 | 3.73 | 7.13 | n.s. |
| Garth | ... | 4.17 | 6.00 | 10.17 | 9.44 |
| Maholi | ... | 4.95 | 6.14 | 11.19 | 10.26 |
| Retreat | ... | 3.36 | 9.82 | 13.19 | 7.92 |
| Sandown | ... | 3.22 | 5.04 | 8.32 | 9.17 |
| Semokwe Reserve | ... | 2.43 | 1.71 | 4.28 | n.s. |
| Tjankwa | ... | .. | 7.21 | ... | 10.91 |
| Tjompanie | ... | 4.06 | 8.92 | 13.17 | 9.20 |
| Chibi— | | | | | |
| Bubye | ... | ... | 1.18 | ... | 4.85 |
| Mtendelende | ... | ... | ... | ... | 5.39 |
| Nuanetsi Homestead | ... | 3.64 | 5.29 | 8.93 | 4.95 |
| Nuanetsi N.C. | ... | 4.05 | 5.96 | 10.12 | n.s. |
| Gwanda— | | | | | |
| Gwanda Gaol | ... | 3.47 | 5.25 | 8.80 | 7.71 |
| Limpopo | ... | 2.28 | 6.08 | 8.36 | 5.39 |
| Mazunga | ... | ... | ... | ... | 6.89 |
| Mtetengwe | ... | 1.93 | 3.64 | 5.57 | 4.40 |
| Tuli | ... | 4.12 | 3.06 | 7.38 | 5.78 |
| Insiza— | | | | | |
| Albany | ... | 2.21 | 5.74 | 7.95 | 8.92 |
| Filabusi | ... | 3.64 | 5.39 | 9.03 | 7.83 |
| Fort Rixon | ... | 2.04 | 5.59 | 7.65 | 8.26 |
| Inyezi | ... | 2.22 | 7.92 | 10.14 | 7.38 |
| Lancaster | ... | 3.62 | 5.70 | 9.37 | 6.57 |
| Scaleby | ... | 2.23 | 5.40 | 7.63 | n.s. |
| Wanezi Mission | ... | 1.52 | 7.89 | 9.41 | n.s. |
| Matobo— | | | | | |
| Bon Accord | ... | 3.35 | 2.66 | 6.04 | n.s. |
| Fort Usher | ... | 5.35 | 6.05 | 11.45 | n.s. |
| Holly's Hope | ... | 4.41 | 3.95 | 8.47 | 6.55 |
| Longsdale | ... | 2.76 | 8.87 | 11.63 | n.s. |
| Matopo Mission | ... | 5.59 | 6 49 | 12.08 | 8.81 |
| Mtshabezi Mission | ... | 4.89 | 4 67 | 9.60 | 7.86 |
| Rhodes Matopo Park | ... | 3.56 | 7.74 | 11.30 | 9.15 |
| Umzingwane— | | | | | |
| Balla Balla | ... | 3.57 | 7.06 | 10.63 | 8.45 |
| Essexvale | ... | 2.61 | 8.47 | 11.11 | 8.03 |
| Hope Fountain | ... | 2.53 | ... | ... | 9 31 |

## RAINFALL—(*Continued*).

| STATION. | 1928. Nov. | 1928. Dec. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **ZONE C.:** | | | | |
| Charter— | | | | |
| Bushy Park ... | ... | ... | ... | 10.98 |
| Enkeldoorn ... | 3.07 | 13.24 | 16.31 | 10.96 |
| Marshbrook ... | 1.94 | 9.43 | 11.37 | 10.76 |
| The Range ... | 2.27 | 8.83 | 11.10 | 10.93 |
| Vrede ... | 1.86 | 7.90 | 9.76 | 11.55 |
| Chilimanzi— | | | | |
| Beacon Hill ... | 2.21 | 11.10 | 13.50 | 8.81 |
| Central Estates ... | 2.60 | 11.35 | 14.08 | 12.22 |
| Fourie's Post ... | 2.13 | 9.45 | 11.58 | 8.39 |
| Orton's Drift ... | 1.94 | 9.96 | 11.90 | 9.43 |
| Sebakwe Post ... | 1.31 | 8.50 | 9.96 | 9.57 |
| Umvuma Railway ... | 1.97 | ... | ... | 10.49 |
| Gwelo— | | | | |
| Cross Roads ... | 1.62 | 12.03 | 13.99 | 10.58 |
| Delano Estate ... | 3.23 | 8.59 | 12.11 | n.s. |
| East Clare Ranch ... | 2.27 | 8.43 | 10.80 | 8.32 |
| Forestvale ... | 4.85 | 8.10 | 13.74 | n.s. |
| Globe and Phœnix Mine ... | 2.88 | 7 26 | 10.70 | 10.07 |
| Lannes Farm ... | 1.44 | 7.25 | 8.76 | n.s. |
| Lalapanzi ... | 2.43 | 8.77 | 11.62 | 12.74 |
| Lyndene ... | 2.22 | 10.71 | 13.09 | 8.72 |
| Woodendhove ... | 3.40 | 10.66 | 14.25 | 10.30 |
| Wold Farm ... | 3.70 | 12.28 | 16.38 | n.s. |
| Hartley— | | | | |
| Ardgowan ... | 2.48 | 9.22 | 11.70 | 11.12 |
| Balwearie ... | 2.17 | 6.34 | 8.63 | 10.59 |
| Battlefields ... | 2.19 | 11.78 | 13.97 | 10.62 |
| Beatrice ... | 6.17 | 9.58 | 15.75 | 11.26 |
| Carnock ... | 6.78 | 5.96 | 12.76 | 12.10 |
| Cromdale ... | 4.09 | 9.06 | 13.15 | 12.17 |
| Currandooley ... | 2.51 | 9.44 | 11.95 | n.s. |
| Eiffel Blue Mine ... | 2.49 | 5.61 | 8 10 | 9.00 |
| Elvington ... | 6.42 | 11.20 | 17.62 | 11.37 |
| Gatooma ... | 1.81 | 8.27 | 10.18 | 11.13 |
| Gatooma Experiment Station | .92 | 6.87 | 7.83 | n.s. |
| Gowerlands ... | 6.01 | 7.48 | 13.49 | 11.14 |
| Handley Cross ... | 2.47 | 6.18 | 8.82 | n.s. |
| Hartley Gaol ... | 2.76 | 7.85 | 10.89 | 11.44 |
| Hopewell ... | 3.86 | 5.55 | 9.61 | 11.33 |
| Jenkinstown ... | 2.97 | ... | ... | 11.56 |
| Maida Vale ... | 1.84 | 8.40 | 10.24 | 9.37 |
| Meadowlands ... | 5.39 | 8.89 | 14.58 | n.s. |
| Nyadgori ... | 2.76 | 5.69 | 8.62 | 11.69 |
| Pulham ... | 3.50 | 8.33 | 11.88 | 12.74 |
| Ranwick ... | 3.37 | 5.84 | 9.38 | 11.86 |
| Sunny Bank ... | 2.07 | 9.40 | 11.47 | n.s. |
| Thorndyke ... | 1.57 | 6.10 | 8.24 | 10.82 |

## RAINFALL—(*Continued*).

| Station. | 1928. | | Total to end of period. | Norma rainfall to end of period. |
|---|---|---|---|---|
| | Nov. | Dec. | | |
| Zone C.—(Continued) | | | | |
| Lomagundi— | | | | |
| Argyle ... | 3.39 | 5.74 | 9.18 | 11.41 |
| Baguta ... | 4.84 | 6.94 | 11.85 | 10.59 |
| Between Rivers ... | 2.79 | 6.09 | 9.46 | n.s. |
| Citrus Estate ... | 6.73 | 6.70 | 13.48 | 10.83 |
| Dalston ... | 1.93 | 7.49 | 9.77 | n.s. |
| Dartmoor ... | 3.40 | 6.00 | 9.62 | n.s. |
| Darwendale .. | ... | 6.60 | ... | 10.45 |
| Dedsi ... | 3.83 | 8.01 | 11.85 | 10.29 |
| Dingley Dell ... | 2.17 | 5.68 | 7.85 | 8.74 |
| Gambuli ... | 2.98 | 6.80 | 9.78 | 11.47 |
| Hartleyton ... | ... | ... | ... | n.s. |
| Kapiri ... | 1.33 | 6.14 | 7.51 | 10.57 |
| Kashao ... | 2.96 | 7.05 | 10.05 | n.s. |
| Kenidia ... | 4.74 | 2.58 | 7.45 | n.s. |
| Mafoota ... | 1.79 | 9.43 | 11.26 | 10.45 |
| Maningwa ... | 3.11 | ... | ... | 11.85 |
| Miami ... | .91 | 4.18 | 5.16 | n.s. |
| Mica Field ... | .33 | 5.50 | 5.95 | 7.41 |
| Montrose ... | 4.26 | 6.36 | 10.77 | 10.30 |
| Mpandegutu ... | 4.27 | 5.52 | 10.10 | 10.30 |
| Msina ... | 2.54 | 6.69 | 9.23 | n.s. |
| Mukwe River Ranch ... | 1.01 | 9.63 | 10.64 | 10.24 |
| Nyapi ... | 6.48 | 5.44 | 12.03 | 9.77 |
| Nyarora ... | 1.62 | 4.92 | 6.61 | 9.88 |
| Nyati ... | 4.24 | 8.39 | 12.87 | 9.21 |
| Palm Tree Farm ... | 1.76 | 7.93 | 9.71 | 10.36 |
| Pendennis ... | .79 | 8.03 | 8.82 | n.s. |
| Raffingora ... | 1.28 | 12.98 | 14.36 | 9.71 |
| Renardia ... | 2.97 | 5.53 | 8.55 | n.s. |
| Richmond ... | 2.86 | 9.28 | 12.14 | 9.13 |
| Robbsdale ... | 2.64 | 9.87 | 12.71 | n.s. |
| Romsey ... | 3.06 | 9.81 | 12.87 | 10.52 |
| Silater Estate ... | 1.76 | 10.70 | 12.53 | 11.96 |
| Sinoia ... | 4.96 | 6.49 | 11.59 | 11.03 |
| Sinoia's Drift ... | ... | ... | ... | n.s. |
| Sipolilo ... | 2.46 | 13.18 | 15.64 | 10.08 |
| Umvukwe Ranch ... | 1.40 | 6.45 | 7.87 | 11.85 |
| Woodleigh ... | 3.72 | 4.70 | 8.52 | 10.57 |
| Yeanling ... | 1.46 | 6.17 | 7.64 | 11.49 |
| Zebra Vlei ... | 2.07 | 7.76 | 9.90 | 9.97 |
| Marandellas— | | | | |
| Rocky Spruit ... | 5.45 | 14.20 | 19.65 | n.s. |
| Mazoe— | | | | |
| Pembi Ranch ... | 2.11 | 10 89 | 13.00 | n.s. |
| Salisbury— | | | | |
| Avondale (Broadlands) ... | 2.77 | 5.93 | 9.07 | 12.29 |
| Ballineety ... | 3.17 | 8.76 | 11.97 | 10.59 |
| Botanical Experiment Station | 3.48 | 5.45 | 9.26 | 11.51 |
| Bromley ... | 4.76 | 6.19 | 10.95 | 11.99 |

## RAINFALL—(*Continued*).

| STATION. | 1928. Nov. | 1928. Dec. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE C.—(Continued) | | | | |
| Salisbury (continued)— | | | | |
| Cleveland Dam ... | 1.99 | 9.81 | 11.82 | 10.80 |
| Forest Nursery ... | 3.83 | 5.84 | 9.87 | 11.71 |
| Gwebi ... | 3.11 | 6.44 | 9.73 | 10.88 |
| Salisbury Agricultural Dept. | 3.06 | 5.24 | 8.65 | 11.72 |
| Sebastopol ... | 4.82 | 6.94 | 12.79 | 11.70 |
| Stapleford ... | 3.83 | 7.97 | 11.82 | 11.86 |
| Tobacco Experiment Station | 2.11 | 5.91 | 8.21 | n.s. |
| Western Commonage ... | 4.02 | 6.39 | 10.58 | 9.94 |
| Sebungwe— | | | | |
| Sikombela ... | 3.84 | 3.97 | 8.11 | 10.47 |
| Wolverley ... | 5.46 | 8.09 | 13.80 | 8.90 |
| ZONE D. : | | | | |
| Darwin— | | | | |
| Chikoa ... | 2.12 | ... | ... | n.s. |
| Cullinan's Ranch ... | 1.76 | 7.57 | 9.33 | n.s. |
| M'gadzi ... | 4.11 | 6.54 | 11.09 | n.s. |
| Mount Darwin ... | 1.59 | ... | ... | 10.18 |
| Rusambo ... | 1.20 | 4.56 | 5.76 | n.s. |
| Inyanga— | | | | |
| Inyanga ... | 4.81 | 11.70 | 16.82 | 11.94 |
| Juliasdale ... | 4.65 | 11.24 | 15.93 | 12.38 |
| Rhodes Estate ... | 5.86 | 12.97 | 19.08 | 13.05 |
| Makoni— | | | | |
| Ardlamont ... | 4.59 | 11.19 | 16.04 | n.s. |
| Eagle's Nest ... | 5.86 | 10.61 | 16.64 | 11.08 |
| Mayo Ranch ... | 2.02 | 10.86 | 13.60 | n.s. |
| Wensleydale ... | 4.71 | 9.07 | 14.18 | 10.97 |
| Mazoe— | | | | |
| Argyle Park ... | 1.91 | 11.07 | 13.17 | n.s. |
| Atherstone ... | 2.71 | 9.95 | 12.71 | 9.35 |
| Bellevue ... | 3.80 | 4.90 | 8.88 | n.s. |
| Bindura ... | 2.25 | 7.15 | 9.40 | 10.02 |
| Ceres ... | 4.28 | 8.93 | 13.42 | 10.81 |
| Chipoli ... | 1.10 | 8.87 | 10.04 | 11.19 |
| Citrus Estate ... | 4.92 | 7.00 | 12.05 | 11.06 |
| Craigengower ... | 6.25 | 10.02 | 16.29 | 11.10 |
| Dandejena ... | 3.86 | 11.54 | 15.42 | n.s. |
| Donje ... | 2.59 | 10.57 | 13.16 | n.s. |
| Frogmore ... | 3.32 | 8.33 | 11.65 | 10.48 |
| Glen Divis ... | 3.50 | 9.82 | 13.32 | 11 57 |
| Glen Grey ... | 3.84 | 7.61 | 11.49 | 9.54 |
| Great B ... | 3.21 | 4.23 | 7.44 | 11.56 |
| Hinten ... | 1.69 | ... | ... | n.s. |
| Horta ... | ... | 11.54 | ... | n.s. |
| Kilmer ... | 5.74 | ... | ... | 11.07 |
| Kingston ... | 3.56 | 10.82 | 14.38 | 11.87 |
| Maienza ... | 3.32 | 11.56 | 14.88 | 10.54 |

## RAINFALL—(*Continued*).

| Station. | 1928. Nov. | 1928. Dec. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| Zone D.—(Continued) | | | | |
| Mazoe (continued)— | | | | |
| Mazoe Dam ... | 3.59 | 5.22 | 8.81 | 10.28 |
| Mgutu ... | 2.49 | 7.07 | 9.56 | 13.25 |
| Muripfumba ... | 4.02 | 6.60 | 10.62 | 9.40 |
| Omeath ... | 3.71 | ... | ... | 10.44 |
| Pearson Settlement ... | 2.85 | 5.81 | 8.86 | 11.68 |
| Riversdale Estate ... | 3.45 | 6.81 | 10.26 | n.s. |
| Ruia ... | 2.53 | 11.43 | 13.96 | 10.79 |
| Rustington ... | 2.04 | 10.14 | 12.18 | 8.27 |
| Shamva Mine ... | 3.14 | 9.54 | 12.69 | 11.27 |
| Stanley Kop ... | 5.71 | 4.08 | 9.79 | 10.38 |
| Sunnyside ... | 4.94 | 7.61 | 12.61 | 11.14 |
| Teign ... | 5.22 | 8.79 | 14.01 | 11.06 |
| Usk ... | 4.02 | 9.64 | 13.66 | 11.15 |
| Virginia ... | 5.07 | 9.66 | 14.73 | 10.10 |
| Visa ... | 3.51 | 8.55 | 12.06 | n.s. |
| Woodlands ... | 4.38 | 8.37 | 12.92 | 10.55 |
| Zombi Farm ... | 3.11 | 10.88 | 13.99 | 12.09 |
| Mrewa— | | | | |
| Maryland ... | 4.51 | 8.70 | 13.31 | n.s. |
| Montclair ... | 4.12 | 10.43 | 15.27 | n.s. |
| Mrewa ... | 1.72 | 11.02 | 12.74 | 12.02 |
| Nyaderi Mission ... | 3.60 | 7.27 | 11.37 | n.s. |
| Selous Nek ... | 1.25 | 8.43 | 9.68 | 11.80 |
| Mtoko— | | | | |
| Makaha ... | 2.35 | 10.33 | 14.31 | 11.20 |
| Mtoko (N.C.) ... | 3.52 | 11.43 | 14.98 | 9.93 |
| Salisbury— | | | | |
| Arcturus ... | 4.73 | 9.22 | 15.35 | 11.47 |
| Chindamora Reserve ... | 4.06 | 4.72 | 9.01 | 12.09 |
| Datata ... | 5.95 | 10.00 | 16.02 | n.s. |
| Glenara ... | 2.23 | 5.49 | 7.90 | 12.24 |
| Goromonzi ... | 5.69 | 10.89 | 16.78 | 11.95 |
| Hatcliffe ... | 3.02 | 4.95 | 8.06 | 12.10 |
| Hillside (Bromley) ... | 4.93 | 6.59 | 11.52 | 12.29 |
| Kilmuir ... | 5.12 | 11.16 | 16.46 | 12.37 |
| Meadows ... | 3.91 | 10.02 | 14.18 | 12.87 |
| Pendennis ... | 2.60 | 5.74 | 8.76 | n.s. |
| Selby ... | 3.55 | 8.27 | 11.82 | 11.05 |
| Springs ... | 5.45 | 7.05 | 12.50 | 11.77 |
| Teviotdale ... | 2.72 | 4.85 | 7.73 | n.s. |
| Vainona ... | 2.68 | 7.07 | 9.90 | 12.35 |
| Zone E. : | | | | |
| Belingwe— | | | | |
| Belingwe (N.C.) ... | .67 | 9.63 | 10.30 | 7.68 |
| Doro ... | 1.51 | 8.68 | 10.19 | 7.33 |
| Shabani ... | 1.44 | 11.13 | 12.58 | 5.80 |

## RAINFALL—*(Continued)*.

| Station. | 1928. Nov. | 1928. Dec. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone E.—(Continued)** | | | | |
| **Bikita—** | | | | |
| Angus Ranch ... | 1.93 | 6.67 | 8.60 | 6.80 |
| Bikita ... | 2.06 | 5.25 | 7.40 | 7.71 |
| Devuli Ranch ... | .98 | ... | ... | 6.98 |
| Pamushana ... | 1.56 | ... | ... | 10.69 |
| **Charter—** | | | | |
| Buhera ... | 3.43 | 6.55 | 9.98 | 12.63 |
| **Chibi—** | | | | |
| Chibi ... | .77 | 11.09 | 11.90 | 7.68 |
| Lundi ... | 2.63 | ... | ... | 6.24 |
| Mpapas ... | 1.43 | ... | ... | 5.16 |
| **Chilimanzi—** | | | | |
| Allanberry ... | 2.65 | 10.19 | 12.84 | 11.13 |
| Driefontein ... | 1.90 | 11.22 | 13.13 | 10.18 |
| Felixburg ... | 1.53 | 10.21 | 11.74 | 10.03 |
| Grootfontein ... | 1.69 | 14.59 | 16.28 | 10.62 |
| Induna Farm ... | 2.95 | 12.51 | 15.48 | 11.98 |
| Mtao Forest ... | 1.87 | 11.16 | 13.13 | 10.24 |
| Mukowries ... | 4.04 | 13.61 | 17.65 | n.s. |
| Thornhill ... | 1.33 | 12.54 | 13.87 | n.s. |
| **Gutu—** | | | | |
| Alheit Mission ... | 3.13 | ... | ... | 9.19 |
| Divuli Store ... | 5.02 | ... | ... | n.s. |
| Eastdale Estate ... | 2.32 | 12.91 | 15.23 | 12.08 |
| Gutu (N.C.) ... | 3.02 | 11.88 | 14.90 | 10.26 |
| Glenary ... | 1.90 | 13.78 | 15.68 | 9.80 |
| **Gwelo—** | | | | |
| Glencraig ... | 5.96 | 13.02 | 19.38 | n.s. |
| Partridge Farm ... | 3.14 | 12.05 | 15.67 | 11.66 |
| Sheep Run Farm ... | 2.57 | 11.98 | 14 77 | 10.38 |
| **Inyanga—** | | | | |
| St. Trias' Hill ... | 5.68 | 11.61 | 17.29 | 12.35 |
| **Insiza—** | | | | |
| Roodeheuvel ... | 2.07 | 6.78 | 8.85 | 8.89 |
| Stoneham (Brac Valley) ... | 2.51 | 7.51 | 10.11 | n.s. |
| **Makoni—** | | | | |
| Bude ... | 5.11 | 9.44 | 14.57 | n.s. |
| Chirumwe ... | 3.70 | 12.51 | 16.21 | n.s. |
| Craigendoran ... | 2.73 | ... | ... | 12.38 |
| Forest Hill ... | 6.07 | 14.39 | 20.54 | 12.59 |
| Gorubi Springs ... | 3.59 | 10.51 | 14.33 | 11.85 |
| Inyagura ... | 3.95 | 11.29 | 15.42 | n.s. |
| Mona ... | 10.01 | 14.06 | 24.34 | 12.80 |
| Monte Cassino ... | 5.51 | 10.92 | 16.43 | 12.11 |
| Ruati ... | 4.24 | 16.95 | 21.69 | n.s. |
| Rusape (N.C.) ... | 4.67 | ... | ... | n.s. |
| Springs ... | 5.10 | 11.54 | 16.64 | 12.59 |
| Tablelands ... | 3.17 | ... | ... | 12.29 |
| Whitgift ... | 3.86 | 13.05 | 16.96 | n.s. |

## RAINFALL—(Continued).

| STATION. | 1928. Nov. | 1928. Dec. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE E.—(Continued) | | | | |
| Marandellas— | | | | |
| Bonongwe ... | 5.68 | 13.46 | 19.19 | 12.07 |
| Delta ... | 3.68 | 13.68 | 17.36 | 11.53 |
| Elandslaagte ... | 3.57 | ... | ... | 12.71 |
| Lushington ... | 4.59 | 8.98 | 13.57 | n.s. |
| Macheke ... | 4.24 | 11.43 | 15.69 | 11.75 |
| Marandellas (N.C.) ... | 4.69 | 12.86 | 17.61 | 12.30 |
| Marandellas Estate ... | 3.71 | 12.03 | 13.74 | 10.43 |
| Nelson ... | 4.05 | 8.30 | 12.35 | 11.46 |
| Wedza Reserve ... | 4.16 | 13.46 | 17.67 | n.s. |
| Wenimbi ... | 3.60 | 8.94 | 12.54 | n.s. |
| Melsetter— | | | | |
| Brackenbury ... | ... | ... | ... | 14.77 |
| New Year's Gift ... | 2.37 | 10.83 | 13.20 | n.s. |
| Sabi Tanganda Estate ... | 2.39 | 6.75 | 9.14 | n.s. |
| Tom's Hope West ... | 7.98 | 12.90 | 21.62 | n.s. |
| Ndanga— | | | | |
| Bangala Ranch ... | 2.68 | 9.67 | 12.35 | n.s. |
| Doornfontein ... | 4.81 | 9.74 | 14.55 | 9.10 |
| Marah Ranch ... | 1.02 | ... | ... | 10.60 |
| Triangle Ranch ... | 2.43 | 6.05 | 8.48 | 4.99 |
| Zaka ... | 4.70 | 5.61 | 10.31 | n.s. |
| Selukwe— | | | | |
| Aberfoyle Ranch ... | 1.64 | 10.78 | 12.67 | 9.18 |
| Hillingdon ... | 2.25 | 8.20 | 10.68 | 11.28 |
| Impali Source ... | 1.11 | 8.78 | 10.11 | 9.35 |
| Rio ... | 1.57 | 11.94 | 13.51 | 9.98 |
| Safago ... | 3.09 | 10.10 | 13.53 | 11.43 |
| Selukwe ... | 1.71 | 11.34 | 13.40 | 11.25 |
| Umtali— | | | | |
| Argyle ... | 4.91 | 6.58 | 11.49 | 11.30 |
| Embeza ... | 6.56 | 14.31 | 21.04 | n.s. |
| Fairview ... | 4.46 | 12.85 | 17.31 | n.s. |
| Fern Valley ... | 3.78 | ... | ... | 9.88 |
| Jerain ... | 2.88 | 13.79 | 17.01 | 9.44 |
| Mutambara Mission ... | 1.95 | 12.72 | 14.76 | 10.13 |
| Odzani Power Station ... | 5.27 | 16.99 | 22.30 | 11.27 |
| Park Farm ... | 4.43 | 15.37 | 19.84 | 8.74 |
| Premier Estate ... | 4.48 | 14.15 | 18.63 | 10.12 |
| Sarum ... | 3.23 | 11.88 | 15.13 | 8.79 |
| Sheba ... | 4.35 | .. | ... | n.s. |
| Stapleford ... | 6.96 | 16.83 | 24.57 | 18.29 |
| St. Augustine's Mission ... | 6.16 | ... | ... | 11.00 |
| Transsau Estate ... | 3.18 | 10.26 | 13.44 | 8.92 |
| Umtali Gaol ... | 4.00 | 15.00 | 19.00 | 9.66 |
| Victoria— | | | | |
| Bruceham ... | 1.48 | 12.03 | 13.51 | 9.26 |
| Cambria ... | 2.58 | 9.73 | 12.31 | 8.18 |
| Cheveden ... | 2.32 | 10.36 | 12.69 | 8.01 |
| Clipsham ... | 1.49 | 13.19 | 14.86 | 9.63 |

## RAINFALL—*(Continued).*

| STATION. | | 1928. Nov. | Dec. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|---|
| ZONE E.—(Continued) | | | | | |
| Victoria (continued)— | | | | | |
| Gokomere | ... | 1.19 | 13.57 | 14.76 | 9.86 |
| Kimberley Ranch | ... | 2.33 | 14.15 | 16 48 | n.s. |
| Mashaba | ... | 1.71 | 12.70 | 14.41 | 9.14 |
| Miltonia | ... | .82 | 12.01 | 12.83 | n.s. |
| Riverdene North | ... | 2.08 | 9.13 | 11.26 | 8.78 |
| Salemore | ... | 3.58 | 8.68 | 12.26 | 11.04 |
| Silver Oaks | ... | 1.05 | 12.40 | 13.46 | 9.87 |
| Stanmore | ... | 1.37 | 8.20 | 9.57 | 9.13 |
| Victoria | ... | 1.67 | 11.57 | 13.24 | 9.26 |
| Zimbabwe | ... | .71 | 13.43 | 14.34 | 7.86 |
| ZONE F.: | | | | | |
| Melsetter— | | | | | |
| Chikore | ... | .95 | 16.40 | 17.37 | 11.72 |
| Chipinga | .. | 1.63 | ... | ... | 13.40 |
| Lettie Swan | ... | 2.49 | 11.55 | 14.25 | n.s. |
| Melsetter | ... | 3.42 | 17.83 | 21.25 | 13.72 |
| Mount Selinda | ... | 1.64 | 16.11 | 17.92 | 15.71 |
| Vermont | ... | 5.52 | 18.34 | 24.05 | 17.51 |
| Umtali— | | | | | |
| Chimeze | ... | 8.47 | ... | ... | 18.07 |
| Cloudlands | ... | 6.63 | 17.53 | 24.17 | n.s. |

## Dates of Meetings of Farmers' Associations, Southern Rhodesia.

| Name of Association. | Place of Meeting. | Secretary. | Feb. | March. |
|---|---|---|---|---|
| | | | 1929 | 1929 |
| Ayrshire—Sipolilo | Various farms | G. H. Cautherley | ... | 9 |
| Banket Junction | Banket Hotel | A. M. Hutchinson | 1 | 1 |
| Beatrice District | Farmers' Hall, Beatrice | W. Krienke | 28 | 28 |
| Bindura | Bindura Farmers' Hall | W. E. Fricker | 8 | 8 |
| Bromley | Farmers' Hall, Bromley Siding | W. D. Grier | 6 | 6 |
| Bubi | Queen's Mine | C. H. Olsen | 12 | 12 |
| Bulawayo Landowners' and Farmers' Association | Library Buildings, Bulawayo | W. A. Carnegie | 14 | 14 |
| Chakari | Handley Cross (Feb.), Deweras (Mar.) | L. T. Tracey | 20 | 20 |
| Daisyfield | Daisyfield (Feb.), Somabula (Mar.) | L. E. Edwards | 16 | 9 |
| Darwendale—Trelawney | Various farms | Charles H. Tanner | 27 | 27 |
| Eastern Districts | Farmers' Hall, Chidza | W. E. Richards | 9 | 9 |
| Enkeldoorn | Enkeldoorn | C. N. Ludlowe | 5 | 5 |
| Enterprise | Farmers' Hall | James Watson | 5 | 5 |
| Essexvale | Essexvale | Col. D. Judson | 17 | 17 |
| Felixburg—Gutu | Fairburn (Feb.), Felixburg (Mar.) | A. J. Bradshaw | 9 | 9 |
| Figtree Branch, R.L. and F.A. | Figtree Hotel | The Secretary | 5 | 5 |
| Gadzema | Gadzema | M. G. Leahy | 8 | 8 |
| Gatooma | Speck's Hotel | B. L. Henderson | 16 | 16 |
| Gatooma (Golden Valley Branch) | Golden Valley Hotel | C. K. James | 9 | 9 |
| Gazaland (South Melsetter) | Chipinga Hotel | Mrs. C. N. Reading | 4 | 4 |
| Greystone | Quarrie Farm | P. J. van der Walt | ... | 9 |
| Gwanda | Lowenthal's Building, Gwanda | N. J. B. Nilson | 16 | 16 |
| Hartley | Old Schoolroom, Hartley | Mrs. F. C. Watson | 23 | 23 |
| Headlands | Headlands | J. A. Eve | ... | ... |
| Hunter's Road | Hunter's Road | R. W. Twilley | 23 | 30 |
| Insiza South | Farm Lancaster | J. Campbell | 14 | 14 |
| Inyazura | Inyazura | W. P. Frudd | 1 | ... |
| Lalapansi | Lalapansi | B. J. Ingle | 9 | 9 |
| Lomagundi | Sinoia | F. W. Robertson | ... | ... |
| Lomagundi West | Various farms | A. A. Bisset | 10 | 10 |
| Macheke | Farmers' Hall, Macheke | Major Hastings | ... | ... |

| | | | | |
|---|---|---|---|---|
| Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association | Various Farms | T. R. Colam | 2 | 2 |
| Makwiro | Makwiro | W. L. Parsons | 15 | 15 |
| Marandellas | Marandellas Farmers' Hall | E. Cruikshank | 1 | 1 |
| Marandellas, Southern | Various farms | B. V. Cherry | 6 | 6 |
| Mashonaland | Mashonaland Farmers' Hall, Salisbury | C. Lamb | 8 | 8 |
| Matobo South | Farmers' Hall, Malundi Farm | A. G. Allen | 16 | ... |
| Matopo Branch, R.L. and F.A. | Farmers' Hall, Malundi | W. Mirtle | 16 | 16 |
| Mazoe (Concession) | Concession Hotel | A. W. Laurie | 8 | 8 |
| Mazoe (Glendale) | Farmers' Hall, Glendale | James S. Brown | 13 | 13 |
| Melsetter | Court House, Melsetter | J. C. Kruger | 14 | 14 |
| Midlands Farmers and Stockowners | Royal Hotel, Gwelo | T. R. van Rooyen | 13 | 13 |
| Ngezi-Umniati | Harvieston, Enkeldoorn | Miss Harvie | 23 | 30 |
| North Umniati | ——— | J. F. Eagar | Not | received |
| Norton and Lydiate District | Norton | R. D. Palmer | 1 | 1 |
| Nyamandhlovu | Nyamandhlovu | R. D. McLean | ... | ... |
| Odzi District Farmers | Odzi Hotel | F. H. Burnett | 2 | 2 |
| Poorte Valley | Various places | A. D. Wilson | 16 | 16 |
| Que Que | Offices of the Que Que Sanitary Board | A. A. Ackerman | 16 | 16 |
| Rusape Farmers' Association | Rusape | R. Munch | 2 | 2 |
| Salisbury South | Various farms | P. Linton | 27 | 27 |
| Selukwe | The Hotel, Selukwe | W. T. Simpson | ... | ... |
| Shamva | Shamva Hotel | W. Stanley-Stollard | 21 | 21 |
| Two Rivers Farming Association | Various farms | W. L. Parsons | 16 | 16 |
| Umboe (Branch of Lomagundi F.A.) | Long Valley (Feb.), Fupi (Mar.) | C. W. S. Ford | 9 | 9 |
| Umvukwe Farmers' and Tobacco Growers' Association | Various ranches | Com. E. Wrightson | 9 | 9 |
| Umtali | Drill Hall, Umtali | A. Howat | 7 | 7 |
| Umvuma and District | Umvuma | S. T. Montgomery | Not | received |
| Victoria | Victoria | G. E. Lamb | 2 | 2 |
| Wankie District | ——— | F. H. Going | Not | received |
| West Umvukwe Farmers' Association | Various farms | G. H. Gordon | 2 | 2 |
| Western | Plumtree Hotel | The Secretary | 9 | 9 |
| Willoughbys | Willoughbys | A. E. Roberts | Not | received |

# Export of Cattle from Southern Rhodesia, 1928.

| Month | Union | | England. | Congo | | N. Rhodesia | Portuguese East Africa. | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Slaughter | | Slaughter | | | | | | | |
| | Johannesburg | I.C.S. for overseas | On hoof | Slaughter | Breeding | Breeding | Slaughter | Trek | Breeding | |
| January ... | 55 | ... | ... | 1,370 | 39 | ... | 108 | ... | ... | 1,572 |
| February ... | 190 | ... | ... | 2,287 | 453 | ... | 111 | ... | ... | 3,041 |
| March ... | 562 | 2,746 | ... | 4,257 | 13 | 192 | 39 | ... | ... | 7,809 |
| April ... | 957 | 4,927 | ... | 3,468 | 12 | 193 | 84 | ... | ... | 9,641 |
| May ... | 1,522 | 5,864 | ... | 4,545 | 11 | ... | 36 | ... | 5 | 11,983 |
| June ... | 2,278 | 6,000 | ... | 1,505 | 949 | ... | 177 | ... | 5 | 10,914 |
| July ... | 1,370 | 2,066 | 140 | 1,458 | 1,682 | 10 | 104 | 33 | ... | 6,863 |
| August ... | 1,400 | 4,949 | ... | 1,372 | 2,352 | ... | ... | 32 | ... | 10,105 |
| September ... | 879 | 571 | ... | 2,076 | 147 | 4 | 32 | ... | ... | 3,709 |
| October ... | 775 | ... | ... | 1,478 | 43 | ... | 38 | 14 | 22 | 2,370 |
| November ... | 334 | ... | ... | 1,096 | ... | ... | ... | ... | ... | 1,430 |
| December ... | 47 | ... | ... | 1,921 | ... | 12 | 12 | ... | ... | 1,992 |

J. M. SINCLAIR,

Chief Veterinary Surgeon.

# Rhodesian Milk Records.

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| De Grendel Rita | Friesland | 6,873.00 | ... | 240 | W. R. Blackwell, Norton. |
| Astralia | do | 783.00 | ... | 30 | do do |
| Ogden Hall Alberta | do | 1,100.00 | ... | 30 | do do |
| Rathwick Princess IV. | do | 5,726.00 | ... | 270 | R. G. Fox, Umtali. |
| Rathwick Maud III. | do | 7,731.00 | ... | 270 | do do |
| Home Park Elske V. | do | 8,051.25 | ... | 270 | do do |
| Home Park Alma V. | do | 8,346.00 | ... | 270 | do do |
| Home Park Agnes | do | 6,885.00 | ... | 210 | do do |
| Umtali Nereid | do | 5,322.25 | ... | 240 | do do |
| Umtali Queen | do | 5,213.25 | ... | 210 | do do |
| Umtali Mary ... | do | 4,441.00 | ... | 210 | do do |
| Erin-go-bragh | do | 3 568.50 | ... | 150 | W. Mitchell, Iron Mine Hill. |
| Groenvlei Bedford Alberta | do | 8,319.05 | ... | 240 | P. T. Webb, Iron Mine Hill. |
| De Grendel Sophie | do | 10,074 00 | 329.36 | 300 | W. R. Waller, Salisbury |
| De Grendel Rebelina | do | 7,632.00 | 251.44 | 210 | do do |
| Bluff Hill Faith | do | 6,985.00 | 241.86 | 300 | do do |
| Bluff Hill Floss | do | 5,869.50 | 191.84 | 210 | do do |
| Bluff Hill Fan... | do | 2,235.50 | 69.87 | 90 | do do |
| Bluff Hill Fancy | do | 2,822.75 | 88.66 | 120 | do do |
| Bluff Hill Fluff | do | 1,428.00 | 44.88 | 60 | do do |
| Harlen's Quest | do | 7,866.75 | 256.62 | 240 | do do |
| Harlen's Query | do | 5,321.25 | 168.56 | 150 | do do |
| Harlen's Dainty | do | 5,765.00 | 188.16 | 150 | do do |
| Harlen's Primrose | do | 2,890.00 | 90 67 | 90 | do do |
| Harlen's Model | do | 2,052.25 | 64.55 | 60 | do do |
| A. V. Spinnekop | do | 1,534.25 | ... | 46 | F. Zeender, Insiza. |
| De Grendel de Hoop | do | 11,814.50 | 379.73 | 320 | Government Farm, Gwebi |
| De Grendel Froukje | do | 12,143.75 | 332.67 | 304 | do do |
| De Grendel Selma | do | 11,034.25 | 314.68 | 266 | do do |
| De Grendel Laura | do | 6,189.25 | 185 74 | 234 | do do |

## RHODESIAN MILK RECORDS (continued).

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| De Grendel Bessie Burger | Friesland | 3,619.75 | 108.92 | 74 | Government Farm, Gwebi |
| De Grendel Stienser | do | 307.00 | 9.63 | 7 | do do |
| Wit Fancy ... | do | 8,602.50 | 266.01 | 352 | do do |
| Mimosa Pel Steinser | do | 7,929.75 | 278.61 | 328 | do do |
| Mimosa Pel Clara II. | do | 9,875.25 | 293.68 | 273 | do do |
| Mimosa Clara X. | do | 10,850.00 | 310.94 | 175 | do do |
| Melrose Corrie... | do | 8,879.25 | 336.23 | 213 | do do |
| Melrose Roosje | do | 5,972.25 | 158.26 | 149 | do do |
| Melrose Maandag | do | 4,090.25 | 148.15 | 98 | do do |
| Madge of Batavia | do | 1,380.00 | 43.28 | 49 | do do |
| Gwebi Laura ... | do | 3,272.00 | 118.31 | 119 | do do |
| Allie ... | do | 4,638.75 | 132.67 | 93 | do do |
| Roodebloem ... | Grade Friesland | 2,970.50 | 85.07 | 105 | do do |
| Waterbloem ... | do | 4,882.75 | 125.81 | 95 | do do |
| Kleinbloem ... | do | 8,149.00 | 257.72 | 295 | do do |
| Clara ... | do | 907.00 | 38.18. | 15 | do do |
| Gwebi Gay ... | do | 454 50 | 15.45 | 17 | do do |
| Elsie ... | do | 6 220.25 | 192.90 | 130 | do do |
| Gladys ... | do | 7,554.00 | 225.94 | 168 | do do |
| Isa ... | do | 3,452.00 | 109.13 | 64 | do do |
| Janie ... | do | 590.50 | 18 36 | 14 | do do |

# Farming Calendar.

## February.

### BEE-KEEPING.

In most parts of the two Rhodesias this month is one of fair activity for all bees, there being as a rule quite enough nectar, pollen, etc., available for all ordinary purposes of rearing, building cells, etc., and working generally for the due upkeep of the colony for the present as well as for the coming winter. Whether there will be any surplus honey for them to store will depend upon what crops the farmer may have on hand at this time, as the usual flora of the land will not supply it until the regular second flow of the year is due, which should be in March to April, according to the season.

Watch carefully for robbers, though, with well attended hives and due care in handling, there should be little to fear in this direction; strong, well filled hives can always repel robbers, which are only successful with weak colonies, and these no apiarist should ever have under his care. Mark well last month's advice, i.e., to have everything in readiness for dealing with unexpected new swarms that may be required as they may come, for nothing is more disconcerting or annoying than to be unready when the time arrives. This applies especially to any swarms that may come from the apiary, for a few days only of neglect of such a hive may easily lead to the moth taking early possession of the combs, and in practically a few hours destroy fully drawn-out combs that would otherwise be of much value for after working upon. Such combs, as they are available, should at once be packed away in an air- and moth-tight box or tin for after usage.

### CITRUS FRUITS.

Newly-planted citrus trees should be kept free of weed growth likely to exclude necessary air and light for their normal and healthy development.

Citrus trees planted in February seldom give satisfactory results; late planted trees do not mature their new growths before winter, and they are more susceptible to winter injury or the ravages of disease or insect pests.

The early planted cover crops will be fit to plough under by the end of the month. Do not delay this operation for fear of the rains ending abruptly. If this occurs, great difficulties will be experienced when attempting to plough in the green crops.

Keep all young shelter belt trees free of weed growth, and loosen the soil round their stems fairly frequently to eliminate possible ant injury.

This is one of the best months for budding citrus trees, either in the nursery or grove—trees that are to be top worked to profitable varieties.

Late out-of-season fruit that may have set during December-January should be stripped from the trees. This fruit is valueless for export, and if allowed to mature, will affect the main crop setting of fruit.

## CROPS.

Cultivate, and keep on cultivating as weather permits, to destroy weeds.

Continue to look out for stalk borer, and, if infection is discovered, deal with infested plants as advised in January notes.

Watch witch weed and continue cultivating and hand pulling it. Plough under witch weed, smother and trap crops.

Where practised, maize can be under-planted with sweet potato vines after the last cultivation for the following season's requirements.

Potatoes and ground nuts will probably need to be ridged again.

Catch crops of quick maturing beans, such as tepary bean, also buckwheat, can still be sown.

Keep down all noxious weeds. This work can be undertaken on wet days.

Make veld grass hay whenever a few days of fine weather permit. Early mowings provide the best hay.

Seed beds of onions for early winter planting can be sown towards the end of the month.

Keep potatoes in a cool shed, well ventilated.

Pick over any potatoes in storage and remove bad ones.

Continue to make as much farm manure as possible.

Begin to ride manure and place in heaps handy to the lands to be manured.

## DAIRYING.

This is normally the flush season as far as dairy produce is concerned; dairy cattle are usually in good condition and cows of average capacity should be able to subsist and maintain a full flow of milk on veld grazing alone. Calves may be given a few hours' exercise on bright, sunny days; young stock, however, should not be allowed to run and graze with the herd, and are best kept in a cool, airy pen, opening on to a small shady paddock, where they can obtain a little exercise.

A good quality of sweet hay and water should always be available for young calves.

Cream deteriorates very rapidly under the conditions which obtain at this time of the year, so that every precaution should be taken to keep the cream as cool as possible pending despatch to the creamery. As there is a greater strain than usual on the separator during the flush months, frequent oiling is necessary, and care should be taken that the machine is mounted on a level foundation. The separator and all other dairy utensils must be cleaned immediately after use. First rinse the utensils with cool or lukewarm water, then wash thoroughly with boiling hot water, washing soda and a scrubbing brush; scald finally with boiling water.

The cheese in the storeroom is apt to develop mould during wet weather. If the cheese is well made and pressed and has a smooth rind, this mould is merely superficial and will not penetrate into the body of the cheese. Rubbing the cheese with a cloth moistened with a weak solution of formalin or permanganate of potash usually checks the development of mould. During these months care must be taken not to use over-acid milk for cheesemaking, and great care should also be taken of the starter. If this latter shows any signs of gasiness or develops any disagreeable flavour or odour it should be discarded and replaced by a fresh, clean starter. The cheese storeroom must be kept dark and flies excluded.

## DECIDUOUS FRUITS.

When sufficiently mature, plough under cover crops. This should be possible towards the end of the month.

Summer pruning should be completed early in the month; little or no advantage will be derived from trees treated when the new wood reaches maturity.

Do not allow fruit to become over-ripe, then expect remunerative prices for it. If it is harvested at the correct stage, then well graded and neatly packed, good prices may be expected for the surplus fruit sold.

This is a good month for budding deciduous fruit trees.

## ENTOMOLOGICAL.

Maize.—The first brood of the stalk borer matures this month, and the young of the second brood may be found amongst the younger leaves. Weeds should be kept down.

Tobacco.—Stem borer, leaf miner and budworms are the chief pests likely to be troublesome. Plants in the field found infested with the first two insects should be heavily pruned or destroyed. The budworm caterpillars can usually be hand picked during the process of topping. (See "Rhodesia Agricultural Journal," December, 1927.)

Potato.—Ladybirds and tuber moth may call for attention. The latter, when very bad, sometimes causes considerable wilting of the crop besides attacking tubers. The ladybirds may be destroyed by spraying with arsenate of lead 1 lb. to 16 gallons of water.

Cabbage Family.—All members of the family are liable to be attacked by the sawfly and webworm. The sawfly may be effectively controlled by dusting during a dry spell with Paris green and slaked lime (1 lb. Paris green and 20 lbs. slaked lime).

Melon Family.—The most important pest is the melon fly, which "stings" the fruit of all species of gourds. Destroy all badly "stung" fruit and spray remainder thoroughly with arsenate of lead (2 ozs. in 4 gallons of water) to which 2½ lbs. of cheap sugar has been added.

Deciduous Fruit.—Apples, pears and late peaches suffer chiefly from fruit moths, which puncture the fruit. No remedy available except covering the trees with netting.

Fig.—The fruit is liable to the attack of the fig weevil. All infested fruit and all wild fruit should be collected and destroyed. The borer in the stem may be killed by inserting a little carbon bisulphide into the burrow and sealing it up.

Poison Baiting.—Poison baiting against surface beetles, cutworms, etc.: No really effective bait has yet been discovered for cutworms, but the following poisoned bait is recommended for surface beetles, etc.: Paris green 1 lb., 180 lbs. maize meal. Mix thoroughly in dry state and add water until the material is of the consistency of a dough. Roll into small balls and place under shade. Spread in the evening.

## FLOWER GARDEN.

Sow carnations, phlox, pansy, verbena, gilias, larkspur, dianthus and pentstemon. The flower garden should be now looking its best, nearly all plants being in bloom. Old and dead flowers should be constantly removed, except when the seed is required. Seeding of the plants shortens their flowering period. All runners and climbers should have constant attention, and be tied up and trained, otherwise they will be damaged by the wind. Dahlias, chrysanthemums and carnations will require staking, as they become top heavy when in flower. Make the first sowing of winter-flowering sweet peas.

## VEGETABLE GARDEN.

Sow now—Beans, beet, cabbage, cauliflower, lettuce, peas, onions, carrots, parsnips, turnips, endive, kohl rabi, rhubarb and all herbs.

## FORESTRY.

Tree planting operations should be carried out on dull, showery days or late in the afternoons. Take care in setting out the plants, avoid bending the roots, and do not plant deeper than the plants were in the seed beds or trays. Steps should be taken to prepare seed beds for the slower growing species, i.e., pines, cypresses and callitris, and seed of these species should be sown for the following season's planting.

## GENERAL.

This is a busy time for the farmer. Weeds will be very much in evidence and difficulty will be experienced in keeping them under. Stock will have fully recovered their condition, but ticks will be troublesome. The dipping tanks must be fully utilised now.

## POULTRY.

Cockerels for future breeding should now have been selected, and those not good enough sold for killing. It pays far better to get rid of all of the latter, even if only at 1s. or 1s. 3d. per lb., than to keep them on, eating their heads off, in the hope of getting a better price. Those good enough for breeding, and they must be good, should be kept till about June; there is a demand for such up to this month. Any surplus at this time should be eaten or sold for what they will fetch. Of those selected for breeding purposes, the owner should keep the best one or two for his own use, with another as a reserve. No poultry keeper should sell his best stock, no matter how high a price is offered for it.

By the end of this month the birds selected for breeding should be mated up. If it is possible, the birds selected for breeding should be given a run on free range for three weeks or so before being put into the breeding pen and fed sparingly; better fertility and better chicks will be the result. If it is possible to run the birds selected for breeding away from the others during the whole of the breeding season, all the better. Any hens that become broody should be kept broody by setting a few china eggs under them until such time as eggs from the breeders come in. Broody hens at this time and for the next five months are valuable.

During the rainy season the scratching litter must be kept dry; if it gets wet it is useless.

Duck hatching can be continued all the year round; the main points are that the young ducks must be kept out of the sun and sleep on dry grass. Nothing is more fatal to ducklings than sun, and dampness at night; and the latter applies, too, to the adults. Unless a dry shed, with a dry, soft layer of chaff or sand, etc., covering the floor of it, is available, it is not wise to hatch turkeys till after the wet season is finished, for it will be labour, food and eggs wasted. If the young turkeys get wet they are almost certain to die. This and the feeding on wet mashes instead of dry food, chopped onions and thick milk are the chief reasons for non-success in the breeding of turkeys.

## STOCK.

Cattle.—Grass should now be at its best, and no anxiety need be felt about feed. In the case of milking cows which have been fed during the earlier rainy months, a little mealie meal, cotton cake or ground nut cake may still be given at milking, if only to bring them quietly to their places. The importance of a clean, light, airy and well-drained shelter for calves cannot be over-estimated. Calves up to three or four months old do not require a great deal of exercise, and on wet days are better left in a dry shed with a little sweet hay. A few hours' exercise on bright days in short grass is all they need. Vigilance in keeping down ticks must not be relaxed. These remarks apply specially to milking

herds and to cattle that are kraaled. Cattle running at large need little attention beyond dipping, and if the calves are not desired from November to March, the bulls must now be taken out of the herd. Weather permitting, no opportunity should be lost of getting in a supply of good sweet hay before the grass is too old. A good lick should always be provided.

Sheep.—Vleis and low-lying ground must be avoided. Sheds should be airy, dry and clean. If grass seeds are troublesome to woolled sheep, an area should be mown for them, or when rain begins to slacken, they may be shorn. If wire worm is troublesome, dose regularly each month with wireworm remedy.

### TOBACCO.

The early tobacco should now be ready for curing. Care should be taken to select only thoroughly ripe leaf for filling the barns, so that the cured product will be uniform. Topping, priming and suckering should be given attention. Selected seed plants should be carefully watched. New land intended for tobacco next year should be ploughed this month, so that all organic matter turned under may be converted into humus before planting time next season.

### WEATHER.

This is often the wettest month of the year, with marked differences of from 10 inches to 15 inches on the eastern mountain ranges, 7½ inches over Mashonaland, 4 inches to 6 inches in Matabeleland, and least, but still some, rains in the Limpopo Valley. The rains may be expected to decrease in intensity after the middle of the month if the season is normal.

# March.

### BEE-KEEPING.

As the latter end of this month should herald the approach of the second and last real honey flow of the season, see that enough extra supers are ready for placing on hives as required, watching also that the fully drawn out combs of shallow frames that are on hand to fill them with are kept free from the wax moth; further, examine all supers that are already on the hives for this serious defect, though strong colonies will as a rule keep the combs free from this pest. March being usually a hot month, look well to the entrance; enlarge when and where necessary, and have ventilating lids on the tops of each hive. Extra ventilation can be provided for when required by placing small metal or wooden wedges underneath the top super, but not to be open enough to let out or in a single bee. Where quilts are noticed to have been eaten or more or less destroyed during the summer months, now is the time to make fresh ones so as to be ready for the closing down and the making snug of each hive when winter approaches; old flour bags or old deck chair canvas make capital quilts. Bees during this month will consume a quantity of water; see that some is always kept in the apiary in floating cork chips. This will save much labour and flight for them, as well as prolong their period of work and usefulness. As stated in last month's notes, flying swarms may be expected now any day, so prepare for their capture if required by having all details and items ready for immediate use.

## CITRUS FRUITS.

Two thorough sprayings about this season, when the rains are usually practically over, at an interval of about two weeks, will often obviate the necessity for further work against scale insects until the beginning of the next wet season. If not already done, orchards should be ploughed and cross-ploughed and worked up into a really good surface, so that the cultivators can be kept going, say, every two weeks until it is necessary to irrigate, after which cultivation should be continued. If March prove a dry month, orange trees holding up a crop of fruit will probably require irrigation, but under normal weather conditions it should not be necessary. The same remarks apply as last month with regard to fruit moths. About the end of this month fall budding can be taken in hand, that is the insertion of buds that are intended to remain dormant until spring. This applies to higher altitudes, but in low country, where the growing season is extended, dormant budding should not be done until latter end of April.

## CROPS.

Watch oats for rust, and, if badly infested, cut crop for hay as soon as weather permits. Ridge late potatoes, and if weather is dry prevent ridges from cracking, to check tuber moth infestation. Finish ploughing under all green manure crops while the ground is still moist enough to promote rapid decomposition. Late in the month begin to cut silage crops and ensile. Cut out barren maize plants and feed to stock or ensile. Cut Sudan grass for hay to permit of final late growth for autumn grazing. Reap any crops that are ready, and plough the stubbles **at once.** Lift ground nuts that are sufficiently matured. Watch for ground nuts making second growth; reap, and when sufficiently dry, place in cocks with nuts inwards and cover the top securely. Sow onion seed beds for winter crop. Watch the weather for hay-making and take advantage of fine spells. Towards the end of the month hay-making should normally be in full swing. Continue to plough all lands in succession immediately the crops are reaped from them. Vleis and irrigable lands should now be ready, or in process of being prepared, for winter crops. Early sowings of Algerian oats, barley or rye for green forage can be made. Allow any potatoes lifted to dry before storing them, but do not leave too long in the sun. Destroy witch weed and other noxious weeds. Continue to make all the kraal manure possible by throwing grass and litter into kraals, yards, etc. Begin to select in the field maize plants for seed purposes, and mark them with slips of coloured cloth. Press on with the breaking up of any virgin land which may have been stumped or cleared earlier in the year. Place orders for grain bags without delay. Early in the month silage pits should be cleaned out or, where necessary, new pits dug.

## DAIRYING.

This is usually the most favourable month of the year for dairy operations. Cooler nights are now in evidence, and there is usually little difficulty in maintaining a low temperature in the dairy and cheese-room. If elementary precautions are taken, all cream should be first grade, and first-class cheese should be made, as a gassy condition of the milk is rare. Dairy cows, unless they are very high producers, can go without extra rations, because the grass is now in seed and grazing is ample. The cheese storeroom is generally full of cheese, and care should be taken to turn the cheese regularly. The windows and doors should be opened at night and closed in the daytime. A little mould on the cheese will not affect its quality, but if the mould is excessive the cheese should be rubbed daily.

Calves which are under four months old should be kept in and allowed to nibble at well-got hay; at the same time a little dry mealie meal and monkey nut cake will do them good and teach them to eat concentrates. An ample supply of clean water should be provided in the calf run.

## ENTOMOLOGICAL.

**Maize.**—The stalk borers of the second brood may now be found in the stalks, but nothing can be done at this stage. Caterpillars sometimes attack the crop as a sequel to cultivation after grass weeds have made too much growth. The caterpillars attack the crop on account of their more natural food being suddenly destroyed. Prevention and not cure is indicated.

Tobacco.—The crop will by this time mostly have outgrown insect injury, but leaf miners and budworms may be in evidence. The latter are usually destroyed by hand when topping. Any plants affected with stem borer should be removed and destroyed.

Potato.—If ladybird beetles or caterpillars are injurious, spray with arsenate of lead (powder) 1 lb. to 30 gallons of water. Careful hilling should be attended to with the object of preventing and checking tuber moth attack.

Vegetable Garden.—If sawfly attacks plants of the cabbage family dust with Paris green 1 lb., fine sifted slaked lime 20 lbs. Against cabbage louse (aphis) wash plants frequently with a strong spray of water. Destroy blister beetles by hand. Plants of the melon family may be baited regularly with arsenate of lead (powder) 1½ ozs., treacle ½ gallon (or cheapest sugar 2½ lbs.), water 4 gallons, to keep down fruit flies. For leaf-eating caterpillars and beetles, etc., spray with arsenate of lead (powder) 1 lb. in 30 gallons of water on foliage which will retain water. Cabbages are best dusted.

Citrus Trees.—Collect and destroy infested fruit to keep down citrus codling. Fruit-piercing moths sometimes attack the fruit during the month, especially navels. They work at night and can only be dealt with at present by hand destruction. The trees should be watched for development of aphis and soft brown scale on the young growth and prompt measures taken. Resin wash at two-thirds standard strength is suitable.

Mosquitoes, House Flies, etc., may be very prevalent during March. Destroy breeding places. Poison or trap adult flies. Attend to screening of residence.

## FLOWER GARDEN.

**Flower seedlings for winter blooming should now be coming on, and should be planted out during showery or cloudy weather. Cuttings of carnations may now be made, and should be taken from selected plants which have borne the choicest blooms. The cuttings should be dibbled in half paraffin tins containing three parts sand to one of loam, and kept in a moist condition in a shady position sheltered from the winds. Make main sowing of winter-flowering sweet peas in a well-prepared and rich soil.**

## VEGETABLE GARDEN.

**The sowing calendar is the same as that recommended for last month. Plant out from seed beds cabbage and cauliflower; care should be taken during this month, as the end of the rainy season approaches, to dig with a fork all the ground in the garden. The heavy rains settle this down hard, and as soon as the dry weather begins the soil cracks and lets out all the sub-soil moisture by evaporation. As soon as the rains cease entirely it is advisable to go over the ground and fine down with a rake, leaving some three or four inches of quite fine soil to act as an earth mulch.**

## FORESTRY.

**Cultivation where necessary should be undertaken between the rows of trees planted out in previous months. If cultivation is carried out with the hoe, care should be taken not to pile earth round the base of the stems. New ground for next season's planting should be roughly broken up with the plough. Bulk plantings may be proceeded with during the month.**

## GENERAL.

At this time the condition of stock on the veld is usually good. It is well, however, to look ahead and make ready for the coming winter by the provision of winter feed in such forms as veld hay, silage, baled fodder from maize, manna, oats, teff, velvet beans, and the like, and by taking steps to ensure that water will be available for the stock in winter as near their grazing ground as may be.

## POULTRY.

The breeding pens should have all been mated up by now, as the first chicks should be out by the beginning of April. Much more care should be used than is usually the case when selecting birds for breeding. Only the very best, i.e., the strong, healthy, vigorous ones from the best layers, should be chosen. A pamphlet on "Selection and Mating for Improvement" can be obtained on application to the Editor or the Poultry Experts. This deals fully with the subject. Always keep an eye on the male bird; many are apt to get thin and run down in health, due to their allowing their mates to eat all the food. Such birds are better breeders than those that chase their mates away from the food. Every male that is being bred from should be given a good meal by himself each day, to ensure health and vigour. The incubator should be thoroughly overhauled, cleaned and disinfected before the eggs are put in.

## STOCK.

Cattle.—The precautions recommended for February apply equally to March. Arrangements should be completed for storing as much silage as it is proposed to make, so that the crops reserved for this purpose may be harvested immediately they are ready.

Sheep.—The same precautions as for February should be taken, but as less rain may be expected, conditions will probably be more favourable. If late winter lambs are not desired, the rams should be removed from the flock.

## TOBACCO.

All late plants should be topped low to hasten maturity. The bales of cured leaf should be examined to ascertain whether or not the tobacco has been baled in proper condition. Seed heads should receive continued care. Land ploughed during February should be disced and rolled to assist the decomposition of organic matter. Tobacco fields already cleared of plants should be immediately ploughed. Tobacco bulks should be examined and turned, if necessary.

## WEATHER.

Rains may be looked for in considerable quantity, though less than in previous months, 5 inches in Mashonaland and 3 inches in Matabeleland being normal, with as usual more on the eastern frontier. No useful rain need be reckoned upon after the end of this month, except on the eastern border, but the rainy season tapers off in an irregular and often erratic manner and without certainty.

# Notes from the "Gazette."

| "*Gazette*" *Date.* | *Items.* |
|---|---|
| | AFRICAN COAST FEVER. |
| 21.12.28. | Government Notice No. 840 adds the farms Nooitgedacht and Randfontein to the Coast Fever area in the Melsetter native district. |
| 21.12.28. | Government Notice No. 841 releases the farms Gelukwewacht, Crystal, Crocodile, Seed and Southfield from the Coast Fever area in the Charter native district. |
| | ROADS. |
| 21.12.28. | The road leading from the homestead on Welcome Home Farm, thence across the farms Denby, Witham, Frome, Mtsiki, joining on the latter farm the road declared under Government Notice No. 212 of 1914, has been closed. (G.N. 847.) |
| 21.12.28. | The following are proclaimed branch roads:— 1. Lydiate-Glenside Road.—That portion on the farms Elandfontein, Lancaster and Bryn to join up the portion declared under Government Notice No. 114 of 1924 and Government Notice No. 381 of 1913. 2. Kent-Cecil Road.—From a point on the Norton-Sandringham Road on Kent Estate; thence in an easterly direction across the said estate and the farms Garvillan, Sherwood and Maine to the common boundary of the farms Maine and Cecil. |
| 28.12.28. | The roads running from Jenkinstown and Alton, forming a junction on the farm Bryn, and then proceeding along the eastern boundaries of the farms Elston Estate and Elston to Lydiate Station, have been closed. (G.N. 856.) |
| 28.12.28. | The following is proclaimed a branch road:— From the homestead on the farm Stella, and thence in a westerly direction in an approximately direct line across the said farm and the farm Melfort to join the Bindura-Darwin road on the latter farm. (G.N. 857.) |
| 4.1.29. | The following is proclaimed as a branch road:— From the Serui Drift on the Norton-Dorton Road, in a straight line across the present outspan, to a point on the farm Tilford; thence to a branching point 400 yards from the southern boundary of the farm Tilford (Malham-Tilford boundary), one branch going in a westerly direction to the common beacon of the farms Tilford, Farnley and Dorton, the other branch going in a southerly direction to cross the Zimbo River on the farm Malham; thence in a south-easterly direction to the Malham-Beverley boundary. (G.N. 8.) |

| "Gazette" Date. | Items. |
|---|---|
| | TRANSIT OF CITRUS TREES. |
| 11.1.29. | His Excellency the Governor-in-Council has been pleased, under and by virtue of the powers conferred on him by the "Importation of Plants Regulations Ordinance, 1904," to permit transit by rail of citrus trees grown in the Union of South Africa through Southern Rhodesia to destinations in Northern Rhodesia and the Belgian Congo, subject to the following conditions:— <br>(1) The trees must be the product of a registered nursery in the Union of South Africa. <br>(2) Each consignment must be accompanied by a special certificate signed by a responsible officer of the Plant Regulatory Service in the Union of South Africa to the effect that there is no danger whatsoever of the trees conveying the infection of citrus canker. <br>(3) A special permit for transit of each consignment must be procured in advance from the Department of Agriculture, Salisbury. <br>(4) Any person guilty of a contravention of these regulations shall, on conviction, be liable to a fine not exceeding £10 (ten pounds). (G.N. 13.) |

# Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

## AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 456. Legumes in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 509. Cotton Culture in Southern Rhodesia, by D. D. Brown.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 539. Barley Growing.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 546. Notes on Fertilisers and Soil Treatment, by T. J. Mossop.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 616. The Ground Nut or Monkey Nut, by C. Mainwaring.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.

No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.
No. 684. Warning to Maize Growers : Maize for Export.
No. 685. Notes on Farm Practices at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Orrdinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
Botanical Specimens for Identification.
Maize Grading Regulations.

## REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.
No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.
No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.
No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy. F.L.S.

No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.
No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.
No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.
No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.
No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.
No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.
No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H G. Mundy, F.L.S.
No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.
No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.
No. 564. A Maize Rotation Experiment, by A. R. Morkel.
No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.
No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.
No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.
No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.
No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.
No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.
No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.

## TOBACCO.

No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.
No. 607. Tobacco Seed Beds, by D. D. Brown.
No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.
No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.
No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.
No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.
No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.
No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).
No. 661. Flue-Curing Tobacco Barns, 12 ft. x 12 ft. x 16 ft., by B. G. Gundry.
No. 665. Tobacco Pests of Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.
No. 671. Wildfire and Angular Spot of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.
No. 676. Mosaic Disease of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.
No. 679. Tobacco Culture in Southern Rhodesia: The Harvesting and Curing of Virginia Tobacco, by D. D. Brown.

No. 689. The Lesser Tobacco Wireworms, by Rupert W. Jack, F.E.S.
No. 690. Thermal Efficiency of Tobacco Barns and Furnaces, by C. L. Robertson, B.A., B.Sc., A.M.I.C.E.
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No. 718. Preliminary Experiments on the Control of White Mould of Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

## STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.
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No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
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No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
No. 361. Statistics of Live Stock and Animal Produce for the Year 1919, by F. Eyles, F.L.S.
No. 380. Statistics of Crops Grown by Europeans in Southern Rhodesia, 1919-20, by H. C. K. Fynn.
No. 393. Statistics of Live Stock and Animal Produce for 1920, by H. C. K. Fynn.
No. 409. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1920-21, by H. C. K. Fynn.
No. 426. Statistics of Live Stock and Animal Products for the Year 1921, by H. C. K. Fynn.
No. 443. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1921-22, by F. Eyles, F.L.S., and H. C. K. Fynn.
No. 459. Statistics of Live Stock and Animal Products for the Year 1922, by A. Borradaile Bell.
No. 484. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1922-23, by A. Borradaile Bell.
No. 502. Winter Crops, 1923, by A. Borradaile Bell.
No. 527. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1923-24, by A. Borradaile Bell.
No. 543. Statistics of Live Stock and Animal Products for the Year 1924, by A. Borradaile Bell.
No. 580. Statistics of Summer Crops Grown by Europeans in Southern Rhodesia for the Season 1924-25, by A. Borradaile Bell, Statistician.
No. 595. Statistics of Live Stock and Animal Products for the Year 1925, by A. Borradaile Bell, Statistician.
No. 626. Statistics of Summer Crops grown by Europeans in Southern Rhodesia for the Season 1925-26, by A. Borradaile Bell, Statistician.
No. 646. Statistics of Live Stock and Animal Products for the Year 1926, by A. Borradaile Bell, Statistician.
No. 682. Agricultural Returns for 1926-7 : Preliminary Returns, by Thomas G. Gibson, Government Statistician.

## LIVE STOCK.

No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 336. Butchering and Flaying.
No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.
No. 381. From Breeder to Butcher; Cattle Feeding Experiment No. 8, by Eric A. Nobbs, Ph.D., B.Sc.
No. 421. From Breeder to Butcher; Cattle Feeding Experiment No. 9, Government Experiment Farm, Gwebi, by E. A. Nobbs, Ph.D., B.Sc., F.H.A.S.
No. 446. From Breeder to Butcher; Cattle Feeding Experiment No. 11, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc., F.H.A.S.
No. 448. The Cattle Industry.
No. 468. From Breeder to Butcher; Cattle Feeding Experiment No. 13, by Eric A. Nobbs, Ph.D., B.Sc.
No. 483. From Breeder to Butcher; Cattle Feeding Experiments Nos. 14 and 15, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc.
No. 584. Merino Sheep in Southern Rhodesia, by H. W. Hilliard.
No. 624. The Construction of Dipping Tanks for Cattle (Revised).
No. 698. The Rearing of Bacon Pigs for Bacon Factory Purposes, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 701. Feeding Bullocks at Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 719. Hand-Rearing of Calves (Revised), by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.
No. 720. Fattening for Beef at the Gwebi Farm, by H. G. Mundy, Chief Agriculturist, and T. J. Needham, Accountant, Agricultural and Veterinary Departments.
Arsenite Cattle Dip—How to Mix.

## DAIRYING.

No. 511. Bacon Curing on the Farm, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 520. Treatment of Gassy Curds in Cheese-making, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 530. The Dairy Industry: Causes of Variation in Cream Tests, by T. Hamilton, M.A., N.D.A., N.D.D.
No. 562. Bacteria and the Dairy Industry, by J. R. Corry, B.Sc. (Agr.).
No. 567. Cottage Cheese, by J. R. Corry, B.Sc. (Agr.).
No. 572. The Pasteurisation of Milk and Cream, by J. R. Corry, B.Sc. (Agr.).
No. 577. Cream Cheese, by J. R. Corry, B.Sc. (Agr.).
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THE RHODESIA

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## Editorial.

*Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:— The Editor, Department of Agriculture, Salisbury.*

**Our Frontispiece.**—The illustration on the page opposite of the homestead and surroundings of Glenlivet farm, Victoria district, shows in an interesting way the contrast between exotic trees and the indigenous vegetation. The average rainfall on the farm Glenlivet is 45 inches.

Among the exotic trees which are thriving on the farm are *Eucalyptus saligna*, *Eucalyptus pilularis*, *Eucalyptus maculata*, *Eucalyptus resinifera* and *Cedrela toona*. Some of the saligna gums when seven years old had a height of 60 feet, with boles 6 inches in diameter. Five-year-old Blackbutts (*Eucalyptus pilularis*) had a height of 70 feet. Mr. Harper is adding each year to his plantations. In a sawmill driven by water power various kinds of indigenous timbers

are sawn into wagon wood, etc. The mill will be available for sawing exotic timber when the trees are of sufficient size.

Many farms similarly situated in the Colony can be developed in the same way.

**Labour-Saving Devices.**—We reproduce elsewhere in this issue of the Journal sketches of several labour-saving devices kindly sent to us by a reader. We trust that the devices, simple in design, will be of service to farmers and will induce others to send us particulars, with a rough drawing if possible, of any similar improvisations which have been proved to effect an economy of labour. We feel sure that there are many such devices known only to the owner, who no doubt will be only too pleased to pass his knowledge on to his fellow farmers. At the same time it may be that there are those who by practical experience have discovered better methods of ploughing, planting, cultivating or reaping than are generally employed, and we would especially ask them to give others the benefit of their knowledge. After all, agricultural practice in this Colony is in a state of evolution, and he would be a bold person who averred that our present methods cannot be improved upon. We invite farmers to make full use of our columns for this purpose.

**Agricultural Research in Southern Rhodesia.**—Intermittently, for many years, the Department of Agriculture has been endeavouring to secure or produce a wheat which will be resistant to rust when grown as a summer crop and also possess the necessary qualities required by the miller. So far the efforts have met with little success, and we are to-day importing practically all our requirements of wheat and flour, amounting in 1927 to a total of £82,724. Farmers will be pleased to learn that more systematic work towards this end is now being undertaken at the Agricultural Experiment Station, Salisbury, the duties being entrusted to Mr. T. K. Sansom, who has recently been appointed to the Department of Agriculture in the capacity of Plant Breeder.

It is of interest to know that Mr. Sansom was the first Rhodesian to be sent overseas by the Government for agricultural training. In 1924 he was awarded one of the four £100 bursaries provided by the Government, and proceeded to Rhodes University College, Grahamstown, where he took his Bachelor of Science degree at the end of 1925 in pure botany and zoology. At the beginning of 1926 he was awarded a further bursary of £400 a year to enable him to proceed to Cambridge University to study plant breeding. Before proceeding to Cambridge, however, he was stationed at the Cotton Breeding Station, Gatooma, where he acquired valuable experience. While at Cambridge Mr. Sansom worked under Professor Sir R. Biffen and Professor Engledow, two of the foremost authorities in the world on wheat and plant breeding generally. In November, 1928, Mr. Sansom took up his present appointment with the Department of Agriculture.

Forty-five varieties of wheat have been selected for experiment in this season's trials, the most promising of which are Kenya Governor, Quality, Pusa 52 A, Cawnpore 13 and Droop 3. It is hoped to breed from these a wheat suited to local conditions, but if unsuccessful new varieties will have to be tried. Such a work naturally entails patient and careful investigation, possibly extending over a number of years. We are, however, hopeful, as is Mr. Sansom, that tangible results will accrue from the present endeavour and thus render it possible to retain in the Colony the large sum of money which is being expended annually on imported wheat.

Another matter which is engaging the attention of the Plant Breeder is the "pinking of maize," a discoloration of the outer integument of the kernel which is said to have been increasing in its incidence during the past few years to the detriment of the maize crop. The object of the investigation is to determine whether "pinking"—as to the origin of which little is known in Rhodesia or in South Africa—is a pathological disease or a hereditary character, and thus enable necessary corrective measures to be taken. We hope in due course to report progress on the results of these two investigations.

**The Dairy Industry of Southern Rhodesia.**—Interesting figures are given in the Statistician's report of winter crop and live stock returns for the year 1927 relative to the dairy industry of this Colony. It is stated, "The dairy industry continues to develop, and if the butter produced on farms has decreased, that produced by the creameries has considerably increased. An estimate of the value to the farmer of the actual dairy products sold (milk, butter, cheese and cream) for the last five years is indicative of the steady increase in this branch of farming."

The figures are as follows:—

| | Estimated total value. £ |
|---|---|
| 1923 ... ... ... ... ... ... ... | 103,000 |
| 1924 ... ... ... ... ... ... ... | 134,000 |
| 1925 ... ... ... ... ... ... ... | 146,000 |
| 1926 ... ... ... ... ... ... ... | 169,000 |
| 1927 ... ... ... ... ... ... ... | 178,000 |

Dealing with the total output of milk, of which hitherto no data have been available, figures are given showing that the estimated aggregate production of milk in Southern Rhodesia has increased from 3,300,000 gallons in 1923 to 5,800,000 gallons in 1927.

Although the production of milk has increased to the figures quoted in the report, we should not lose sight of the fact that the average production per cow has not increased in the same proportion as the aggregate production. Better bulls, better cows and better treatment of dairy stock should eventually have the desired effect of raising our standard production to a degree much higher than obtained at present. At Gwebi Farm quite a large proportion of the cows being milked give approximately 1,000 gallons and over per lactation, and recently the production per cow has reached the high average of almost 4½ gallons per day. Twenty-four cows were being milked during a recent visit, and the total amount of milk produced was over 100 gallons per day. It would be difficult to find a higher average production throughout South Africa, and this result is due to the fact that the cattle are well fed, well looked after and well milked. It should be stated, however, that in addition to grazing cows

were receiving on an average 2 lbs. of concentrates for every gallon of milk produced.

In stressing the necessity for better feeding and better treatment, the paramount importance of keeping accurate records of milk production should not be overlooked. Many dairy farmers are to-day milking animals which do not pay for their keep and should have no place in the herd. Rough and ready methods of estimating milking capacity give no reliable record of actual production, and frequently useless cows are retained in ignorance of their true worth. The milk recording scheme, to which frequent reference has been made in this Journal, is available to all who wish to make use of it. In the list published in the last issue of the Journal the total number of farmers recording milk production was seven. We should like to see this small total materially increased in the near future.

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**Distemper in Dogs.**—Dog lovers the world over will be pleased to know that the dread disease of distemper can now be prevented by a process of inoculation. For some five years past *The Field* newspaper has conducted a careful enquiry into the cause of the disease, and by means of a fund raised through its efforts enabled serious researches to be carried out by Dr. Laidlaw and Mr. G. W. Dunkin, D.V.H., M.R.C.V.S., at the Mill Hill laboratories of the Medical Research Council. As a result of this work *The Field* announced, in its issue of 29th November last, that a complete preventive of distemper has been discovered. The report of the investigators was submitted on their behalf to *The Field* Distemper Council at a meeting over which the Duke of Portland presided, and to the Medical Research Council, of which Earl Balfour is President. The report was published in full in *The Field*, with an introduction by Sir Charles Martin, F.R.S.

Many difficulties were encountered in finding the true nature of the virus or poison which produces distemper in dogs, but it is stated to have been identified beyond doubt. This having been accomplished, the task of employing it so as to render dogs immune from attacks of distemper pre-

sented further difficulties, but it is now established that dogs can be completely immunised.

The most convincing demonstration of this is afforded by the fact that no fewer than 1,300 dogs and hounds of many breeds have been inoculated with success. All these dogs, after treatment at the Distemper Research Station, proved to be completely resistant to the disease afterwards, whether they were exposed to infection by close contact with other dogs suffering from acute distemper, or whether an attempt was made to inoculate them with the actual poison of distemper.

The method of preventing distemper in any given dog consists of a double inoculation. Distemper occurs in dogs, not as was once supposed by a visible germ or micro-organism, but by an invisible one which is recognisable only by the virus or poison which is the sign of the organism's presence. The virus is the concomitant of the organism causing distemper in dogs, and is present in all cases of distemper. The first inoculation of the dog which is selected for treatment is made with a vaccine which is in fact the virus of distemper made inactive by laboratory treatment. The second inoculation is made after an interval of about ten days with a weak or attenuated strain of the living virus. This dose of living virus is a hundred times as much as that which would suffice to infect any dog with distemper which had not been previously vaccinated with the first vaccine, or had not suffered from distemper already. With a dog so vaccinated, however, the dose of living poison produces only slight symptoms, sometimes none at all, because it is rendered partially immune by the first vaccination. The second vaccination makes it completely and permanently immune.

We understand that the preparations of the vaccine and of the virus requisite for the inoculations are not yet available for distribution among the general public, or even among veterinary practitioners, who are the proper people to employ them; but arrangements will be made for their production by responsible biological chemists on a scale such as will make them generally available.

**Applications of Science in Agriculture.**—In the course of an article in the Empire Cotton Growing Review for January, 1929, Sir John Russell, F.R.S., Director of Rothamsted Experimental Station, describes an instance of the manner in which research officers at Home are collaborating with workers in other fields in the solution of a particular problem. The subject is the investigation of the angular leaf-spot of the Black Arm Disease of cotton caused by *Bacterium malvacearum*. He shows how an officer at Rothamsted, working in conjunction with research workers in the Sudan, has set up miniature glass houses in which cotton is growing under any desired conditions of temperature, humidity and light. Everything is controlled electrically; a slight rise in temperature or humidity at once sets the correcting mechanism going to put things right once more; the electric sun is made to rise at six and to set at six automatically. Clean, strong cotton plants are grown right through to seed formation; indeed, seed free from any taint of disease has been raised and sent out to Sudan. Some of the plants are deliberately infected with the disease-producing organism, and its development in the tissues is studied; the relationships of soil and air temperature, water-supply in the soil, humidity in the atmosphere, and other factors to its progress are also fully investigated. The information thus obtained will, of course, be checked in the Sudan, but already it appears likely to save a lot of work there by discriminating between the paths which will probably lead somewhere and those that will not. As all investigators know, much of the time spent in applied research is taken up in following the wrong track, and it is exceedingly helpful to be put on the probably right one straight away.

We might here explain that *Black Arm of Cotton* is the advanced stage of angular leaf-spot, which is common throughout Southern Rhodesia. It is, however, distinct from angular spot of tobacco. The bacterium is carried in the seed and is partially controlled by sulphuric acid treatment, but certain climatic and soil conditions are necessary for a severe epidemic to occur. In certain countries, e.g., the Sudan, the Black Arm stage, which really causes the most damage, becomes practically a limiting factor in cotton growing, and until the conditions necessary for its development

are fully understood, little can be done to control it. Hence the critical nature of the work being carried out at Rothamsted with apparatus quite beyond the means of the Sudan Government. Similar work upon the quality of tobacco leaf grown under varying conditions of temperature, humidity, sunlight, etc., would possibly go a long way towards solving the problem of the particular flavour of our leaf.

Another investigation to which Sir John Russell refers is one into the nature of the virus diseases of plants. In this work Dr. J. Henderson Smith, of Rothamsted, is being assisted by a cytologist, a plant physiologist, and an entomologist. It is stated that these diseases are spreading throughout the Empire, and that the agent that causes them has not yet been discovered, so that it cannot be dealt with. The organism apparently is so small that it passes through bacterial filters, and it cannot be grown on any medium yet tried.

For the information of our readers it should be stated that virus diseases are infectious and in most cases are transmitted by insects. Tobacco mosaic is an example. A very large number of previously obscure affections of plants are now found to be due to viruses—such as degeneration of potato seed—and enormous losses are occasioned every year throughout the world. Many diseases are so serious that strict legislation is enforced against their introduction and dissemination in a new country. In Southern Rhodesia the Entomologist and Mycologist are co-operating in an investigation into the transmission and dissemination of potato degeneration and tobacco mosaic disease. The work is very detailed and difficult, as the plants grown must be kept in cages in order to eliminate all insects except those actually admitted to the plant. Mosaic disease is the worst enemy of tobacco in this Colony and can be adequately controlled by "roguing," viz., pulling out undesirable plants, but unfortunately sufficient attention is not paid to this by farmers, who do not realise the highly infective nature of the disease and the large losses that it causes.

In his concluding remarks Sir John Russell expresses the opinion that experience leads him to be hopeful about the future. "With the speeding up of communications between all parts of the Empire and England there is arising a spirit

of co-operation between agricultural workers overseas and those at home; this has been fostered by the grants made by the Empire Cotton Growing Corporation to certain home institutions, Rothamsted among others, thereby securing centres where experts in cotton growing can be sure of a welcome and sympathetic discussion of their problems. Further, the development of scientific appliances enables the investigator to reproduce conditions for growth with an accuracy and certainty unattainable twenty years ago. The home institution can therefore go much further than has hitherto been possible towards lightening the task of the man in the field by providing him with precise information obtained under temperature and moisture conditions identical with his own."

We venture the opinion that this spirit of co-operation, of which practical evidence is given by the instance quoted by Sir John Rüssell of the investigation of Black Arm disease of cotton in the Sudan, is a happy augury for the future. That His Majesty's Government is fully alive to the necessity for co-operation and co-ordination of effort is manifested by the grants by the Empire Marketing Board for pasture improvement investigation, in which this Colony is participating. We have no doubt that as time goes on means will be found to bring research workers into still closer touch with each other and thus help forward the solution of the many problems which confront the agricultural communities of the Empire.

# Farmyard Manure.

By A. P. Taylor, M.A., B.Sc., Agricultural Chemist.

**Historical.**—The value of farmyard manure towards maintaining and increasing the fertility of the soil has been known and recognised by mankind for many hundreds, even thousands, of years. We have it referred to in several places in that oldest of all books, the Bible, as "dung on the face of the earth, field," etc.; we have references to it in Greek in the works of Aristotle and others, in Latin in Lucretius, Livy, etc., and in the works of less ancient writers mention is made of it frequently. Most of us remember from our school days the story of the Roman farmer Stercutius who was declared a god by his compatriots, because he found out for himself, and passed on to them, the fact that tillage and manuring improved the ground.

Nevertheless, although the beneficial effects of manuring have long been recognised, it is only since the beginning of last century, with the spread of scientific learning in general, that any accurate knowledge has been obtained of the functions of manures and the principles of manuring. Originally manuring meant working the soil by hand (Lat. *manus*—a hand), so that in bygone days, tillage and manuring were synonymous terms, as exemplified by the statement of the historic English farmer, Jethro Tull, who, about the year 1700, made the statement "tillage is manure." He was laughed at, of course, as all early theorists have ever been, for presuming to suggest that adding manure in the form of dung could help to pulverise the soil, and so render the particles small enough to be assimilated, which was then the rudimentary idea of the purpose of tillage. There is, however, a modicum of truth in his idea, inasmuch as the addition of dung to the soil does favourably influence the assimilation of plant food, although we with our modern knowledge now know that manures have different and other

much wider uses. Jethro, however, as an elementary agricultural investigator undoubtedly gave succeeding generations an excellent clue. Throughout last century and the end of the previous one, various more correct theories as to the action of manures were put forward from time to time, and now as the result of continuous experiment in various up-to-date agricultural research stations, our knowledge of the action of manures and of the means by which they are enabled to maintain and increase the soil's fertility is very much greater.

**Definition.**—Farmyard manure goes by various names, and the terms fold manure, cattle manure, dung, and in South Africa, kraal manure, are synonymous, but throughout this article the term "farmyard manure" will be adhered to. It may be defined in the simplest of terms as the solid and liquid excreta of animals absorbed in litter of some kind, usually, but not necessarily so, the straw of some cereal.

**Manure and Fertiliser.**—At this point, it might be well to clear up any confusion that may exist between the terms "manure" and "fertiliser." Unfortunately, these words are used indiscriminately, not only in common phraseology, but in many excellent text books, to connote any substance which is applied to the soil for the purpose of increasing directly or indirectly the yield of the crop on it. There is really, however, a vast difference between the two, in that, while as a rule a fertiliser merely supplies plant food ingredients to the soil, a manure has other equally important functions in maintaining soil fertility.

In the first place it supplies organic matter, which, ultimately, by the action of the bacteria in the soil, is converted into humus, without which no fertility can be obtained. This is what is meant when we say that it gives "body" or "heart" to a soil, and all good farmers recognise that a soil must be "in good heart" to be capable of yielding good crops. Further, a manure improves the physical condition of a soil, an effect which an artificial fertiliser cannot attain. This applies both to light and to heavy soils. The former are given more "body," and so are able to retain to a better degree elements of plant food which may subsequently be applied, and in addition the moisture-retaining capacity is

improved and the soil does not so readily parch in times of drought. Heavy soils are rendered more porous, and therefore easier to work, air and water are more freely allowed to permeate, and there is less danger of stagnation and water-logging.

There is yet one other respect in which manures differ from fertilisers and that is in the faculty the former have of supplying the soil with numerous bacteria which stimulate its activity, for farmyard manure is by no means a dead thing, being full of bacterial life. The functions of these bacteria are of various kinds, but, generally speaking, they render available as plant food the organic matter contained in the soil either originally or that which has been supplied to it in the manure itself.

There is no intention here to in any way deprecate by these remarks the value of artificial fertilisers. On the contrary, it is most essential that they should to a greater or less degree be applied usually yearly, but it must be understood *that they can never completely replace farmyard manure*, because they do not supply humus to the soil, nor do they give to it the mechanical condition which is essential to all good plant growth.

In fact it has been found that to apply some artificial fertilisers alone year after year tends even to harm the physical and chemical properties of some soils. For example, nitrate of soda has a strong deflocculating effect upon clay, rendering it hard and impervious to moisture and air, besides at the same time making it more and more alkaline in reaction, owing to the fact that the soda base is not required by the plants, and so accumulates in the soil.

On the other hand, fertilisers like sulphates of ammonia and potash, and also muriate of potash, if applied continuously by themselves, render the soil acid in the long run, because in their case the acidic portion is the portion not required by plants, and so is left behind in the soil.

The importance of a correct combination of farmyard manure and artificial fertilisers will be treated in a later paragraph of this article.

**Composition of Farmyard Manure.**—Farmyard manure in the rough consists of—

(a) the undigested portion of the food evacuated in the solid form;
(b) the urine, containing digested matter which was not retained by the animal, and also waste of the body tissues;
(c) the material used as litter.

The actual chemical composition of farmyard manure, however, in so far as it refers to the proportions of plant foods contained in it, cannot be expressed in any such definite terms, for, as will be seen later, there are so many factors to be taken into consideration with regard to the three above sections, that the composition may vary within wide limits. Before proceeding to particularise, and considering only the three elements of plant food usually deficient in soils, namely, nitrogen, phosphates and potash, it may be assumed that a ton (2,000 lbs.) of fresh farmyard manure consisting of cattle and horse excreta, together with straw, grasses, etc., contains on a very rough average about 10 lbs. nitrogen, 5 lbs. phosphoric oxide and 10 lbs. potash.

At this point the question naturally arises as to the disposition of the balance of 1,975 lbs., but we must not forget the very large proportion of water in an average fresh farmyard manure. This has been estimated at roughly 75 per cent. of the whole, or 1,500 lbs., and the remaining 475 lbs. consist of insoluble or difficultly soluble matter, matter with which the elements of plant food already mentioned are in combination, various more or less inert gases, fibrous materials, substances which are of no practical value in crop production, but which nevertheless play an essential part in improving the mechanical condition of the soil.

**The Solid Matter.**—This, as stated above, consists of the undigested food passed through the animal's digestive system and evacuated as fæces. Its percentage composition corresponds closely to that of the solid matter in the food, but it has been calculated that only about half of it reappears in the manure, and, of course, in its tortuous passage, it has undergone certain changes. In the first place it has been ground down into fine particles in the process of mastication, and the action of the salivary and digestive juices in the alimentary tract has the effect of materially softening it. Further, bacterial fermentation has really its commencement

in the large intestines of the animal after the food has undergone the ordinary digestive fermentation in the stomach and small intestines, where the presence of the gastric acids holds the putrefactive bacteria in check. As, however, a study of the digestive processes does not come within the scope of this article, suffice it to say that when the fæces are ultimately expelled they already contain an enormous number of bacteria capable of carrying on their work later in the soil, work which must necessarily be done before the matter can become available and of benefit to the roots of the plants. Before it can be so, these bacteria must humify the mass and replace it as far as is chemically possible by simple soluble compounds, such as nitrates, phosphates, potash salts, etc., substances which are of direct use as plant food. The solid matter of the manure contains practically all the phosphates voided by the animal, very little of these passing through in the urine, but on the other hand a much smaller proportion of nitrogen and potash.

**The Liquid Matter.**—The urine of animals contains so small a proportion of phosphates as to be negligible, but contains anything up to 2 per cent. of its weight of nitrogen, and slightly more of potash, and not only are these two substances more abundant here than in the solid matter, but they have the additional advantage of being more readily available as plant food, seeing that they are in the liquid state. The nitrogen of urine is present in the first place in the soluble forms of urea, uric and hippuric acids, all of which readily undergo ammoniacal fermentation by the action of special ammonifying bacteria, and become converted into ammonium carbonate. From this stage the nitrifying process to the final stage of a nitrate, which forms the nitrogenous food of crops, is short, and as usual. The chemical changes involved in the first stage of this conversion, the change to ammonium carbonate, are really simple ones, and easily understood even without an advanced knowledge of chemistry. When water is added to urea, carbonic acid gas and ammonia are formed, but instantly combine with another molecule of water to form ammonium carbonate. All that the bacteria, therefore, in the urine have to do is to cause the urea to take up water and become ammonium carbonate, which, provided there is sufficient air and a high enough temperature

(about 80° F. is considered best), is a process accomplished in two or three days.

The conversion of the uric and hippuric acids into ammonium carbonate is a similar process. Owing to the rapidity with which this action takes place, there is great danger of much valuable nitrogen being lost by escaping into the air as ammonia, or by leaching, but attention will again be called to this in connection with the manner of storage and conservation of farmyard manure.

**The Litter.**—As might be expected, farmyard manure varies considerably in composition according to the nature of the material used as bedding for the animals, upon which the fæces and urine are deposited. Not only does the variation depend upon the composition of this material, but also upon the power it has of absorbing and retaining the liquid matter. In fact, this latter factor is really the more important, because, however rich the material may be in plant food ingredients, the availability is much slower than is that of the fæces and urine, and it is probably more profitable to apply the manure before the litter has become entirely available rather than to risk the loss of part of the rest by volatilisation, leaching, etc. Any absorbent vegetable substance will serve as a litter, but those most commonly used are straws of cereals and grasses, leaves, peat, sawdust. The last named is given as an example of a litter which is of value as an absorbent only, for, although it naturally contains certain percentages of essential plant foods, none of them is of real practical value in crop production. The nitrogen of peat runs to about 40 per cent., but is very slowly available.

**Further Variations in the Value of Farmyard Manure. The Kind of Animal.**—Under this is included not only the particular type of animal, such as ox, horse, pig, etc., but also the age of the animal and the nature of the work it has got to do. It stands to reason that the excreta from young growing animals and from cows kept for milk-producing purposes must be more poorly supplied in the elements of plant food than that of full-grown working or fattening animals, because in the first case these elements, particularly phosphates and nitrogen, have been required for the building

up of bone and flesh, and in the second case they have been required to manufacture the milk. It has been found at Rothamsted, in connection with research on this subject, that whereas the excreta of a dairy cow feeding on decorticated cotton cake contains only 87 per cent. of the total nitrogen in that cake, 89 per cent. of the phosphoric acid and 86 per cent. of the potash, that of a fattening bullock fed on the same cake contains these constituents in the percentages 97, 96 and 99 respectively. This points to the significant fact that per 100 lbs. of cake, the milk cow extracts 10 lbs. of nitrogen, 7 lbs. of phosphoric acid and 13 lbs. of potash more than the bullock, leaving the manure of the bullock richer by these quantities per 100 lbs. of cake eaten.

The variation in the value of manure from different types of animals is mainly due to the difference in moisture content, and this difference also distinguishes between what is known as a "hot manure" and what we know as a "cold manure." A "hot manure," such as that of poultry, horses and sheep, has a comparatively low moisture content, so is liable to ferment easily, and this fermentation is accompanied by a great deal of heat. A "cold manure," on the other hand, such as that from oxen and pigs, contains a larger percentage of water, and so does not develop the same amount of heat per unit of time; further, it is not so concentrated as a "hot manure" owing to its larger moisture content.

It is generally recognised that poultry manure is the richest in plant food of all manure. This is due partly to its having the aforementioned characteristics of a "hot manure," and partly to the fact that poultry foods are, in the main, highly concentrated. The average general farmer, however, does not lay much stress on poultry manure, as he rarely has it in sufficient bulk himself, and it would scarcely be economically profitable for him to import large quantities from a distance. Its water content is about 55 per cent.

Of the ordinary farm stock, sheep give us the richest manure; it is another "hot manure," containing about 60 per cent. water. The manure from horses, especially grain fed animals, is hot and dry; it therefore ferments rapidly, is quick acting, but decomposes rapidly, and so is not of a

lasting nature. Grass-fed horses give a poorer manure, slower in action. Horse manure on an average shows 78 per cent. water. Cattle and pig manures, although commonest, particularly the former, are really poorest of all, containing up to 87 per cent. water; they are, however, owing to the slowness of fermentation, very durable, and have the advantage of being delayed and protracted in action, which compensates materially for their comparative poorness in percentage composition of plant food.

**The Food Factor.**—This is probably the predominant factor influencing the ultimate value of farmyard manure, and particularly the percentage of nitrogen in it. In the average of all farm animals, and taking the whole excreta (fæces and urine) together, the nitrogen yielded has been calculated as between 70 to 95 per cent. of that eaten, and this wide range of 25 per cent. is due to the great variation in the supply of proteins or nitrogenous substances in the food. Generally speaking, animals fed on highly concentrated foods or "concentrates," which contain a large percentage of nitrogen, phosphoric acid and potash, will produce much better manure than those fed upon roughages such as straw, hay, grass, which usually have a small proportion of plant food in their composition and are low in digestibility. This does not strictly apply to potash, as roughages often work out to a slightly higher percentage of this substance than do concentrates, but otherwise the statement is a correct one.

**The Manner of Storage.**—This is another factor having important bearing on the value of manure, and it is not necessary to labour the point that properly stored and properly managed manure is much more valuable than mismanaged stuff where much valuable plant food has been lost. In connection with this part of the subject, attention should be paid to the following points:—

(1) Prevention of leaching of liquids by proper storage.

(2) Prevention of over-heating and consequent loss of nitrogen.

(3) Attainment of equality of composition.

**Prevention of Leaching.**—There can be no more deplorable sight to the eye of an economical and intelligent farmer

than streams of black liquid flowing away either slowly or rapidly from an accumulation of farmyard manure. These streams are very rich in the soluble ingredients—the most valuable because the most readily available ingredients—of the manure, and are particularly rich in nitrogen and in potash, for they mainly consist of urine, in which much humus is dissolved. It is a common idea, because these black streams smell strongly of ammonia, that nitrogen only is carried away by them, but experimental work has shown that even more potash than nitrogen is lost in this way. In a series of experiments extending over four years at Cockle Park, Northumberlandshire, arranged so that the only losses could accrue through leaching, it was found that whereas 23 per cent. of the total potash in the manure under observation was lost, only 15 per cent. of the organic matter and nitrogen combined drained away. As recently, too, as December last, in the issue for that month of the Journal of the Ministry of Agriculture for Great Britain, it was pointed out by Mr. H. V. Garner, of Rothamsted Experimental Station, that the potash in straw is readily water-soluble, a fact which is not usually taken into account in considering the losses by leaching. Little or no phosphoric acid is lost in this way.

There are two means of preventing this waste—either (a) we must entirely prevent this liquid flowing away, or (b) we must capture it by some means and use it.

(a) The most effective means of all of preventing liquid manure escaping is, of course, to use a generous supply of litter possessing good absorbent qualities. Where there are difficulties with regard to this, then special precautions for preventing waste of liquid must be taken in the construction of the manure shed, or dungstead, as it is commonly called, and the first point to be given attention to is the floor. Concrete is undoubtedly the most satisfactory form of floor, and the initial expense, though fairly heavy, is the last. Wooden floors are in use in some quarters, but are not recommended for this country, as they decay too rapidly in our climate. The most common type of floor, on account of its cheapness—and if carefully prepared, little or no loss takes place through it—is one of well packed earth or clay, a foot or more in thickness, and overlaid by rubble.

A certain height of wall is a necessity in order to prevent loss by drainage. The height will depend upon the quantity of manure likely to be stored, but should not be lower than three feet from the floor, and preferably higher. Cement or cemented brickwork is again the best form. When the walls are low, a door is not a necessity, as the manure can be pitched over, both in and out, but where the walls are high, and a door of course is essential both for ingress and egress of the manure, then the floor must be laid with a distinct slope backwards away from the door.

In a country such as Southern Rhodesia, subject to torrential downpours of rain, a roof over the dungstead is a necessity, although it need not be more than a shelter of galvanised iron, or some equally effective material. Care ought to be taken, of course, when the walls are low, that no washings from the shelter fall on the heap. This can be easily effected by making the surface area of the roof considerably larger than that of the floor.

Another method of storing manure which has been gaining favour of late years among farmers in Great Britain, and also among some Rhodesian farmers, is to have the dungstead in the form of a rectangular pit, not too deep, and with a properly constructed floor as above, and watertight sides. The advantage over the above-ground system is that the manure can be kept more compact by the constant wheeling of the carts with fresh supplies over it, or by the animals actually treading on it themselves when the pit is made accessible to them, as in the covered-in "byres" or "folds" of Scotland and England. There the manure is left throughout the whole feeding season in the actual feeding pens, and gradually accumulates, fresh litter being put in each day. By the constant treading of the animals a compact mass of rich manure is obtained and the health of the beasts in no way suffers. A roof of some nature is again necessary. The only disadvantage compared with the above-ground system is that the initial expense of construction is considerably greater, and unless the quantity of manure stored per year is on a very large scale, the former method is probably in the long run the more profitable. When, as often is the case, it is necessary or advisable for various reasons to go to the least possible expense as regards storage

arrangements, and to store the manure outside altogether, the most practicable method is to remove the surface soil from the selected site, to break up the sub-soil, put the manure on top, cover it with the discarded surface soil, and then when required, to spread the manure and sub-soil judiciously mixed on the fields. This reduces to a minimum losses due to drainage and volatilisation.

(b) Many farmers with up-to-date farm buildings now-a-days have drainage arrangements constructed from the manure heap so that escaping liquids are conducted to a tank, from which they can be pumped into a liquid manure cart and distributed directly over the grass lands. This is an excellent procedure, if the nature and the lie of the lands allow of it, but sometimes local conditions make it awkward or impossible. It is not advisable to pour it over arable land, because great loss of nitrogen may be expected by volatilisation, unless the liquid can be quickly covered with soil, which usually is impracticable. A thin covering of oil should be given to the liquid in the tank to exclude air, and thereby minimise loss by fermentation.

Another, and probably uniformly better plan, is to employ the pump to distribute the liquid from the tank over the dry upper surface of the heap. By doing this repeatedly, the liquid gradually evaporates and becomes more concentrated, and so the process increases the percentage composition of valuable ingredients in the heap, simultaneously reducing the amount of liquid in the tank, and constantly keeping the manure thoroughly moist, thereby lowering its temperature, and consequently its rate of decomposition.

**Overheating.**—A smoking, or more strictly speaking steaming, dung-heap is an ordinary sight, especially when the heap has just been turned over, or when it has newly been carted on to the land. This shows that combustion and fermentation are going on more or less rapidly, and this, of course, is as it should be, and must occur before the manure can get into the necessary "rotten" condition to be of value to the soil and consequently to the plants. If, however, the heat is allowed to become excessive, then much loss in fertilising value is liable to occur. In the first place, bacterial changes will proceed very rapidly, depending on the amount of heat evolved, and nitrogen in the form of

ammonia will escape into the air and be lost; we are all familiar with the pungent smell of ammonia arising from badly managed dung-heaps, and from horse stables. Again, the weight of organic matter is lessened, and consequently a reduced supply of humus is ultimately incorporated with the soil.

Yet one other loss liable to be caused by overheating is that form of loss of nitrogen known as "denitrification," a word which has one or other of two different meanings. It may mean simply the actual evolution of nitrogen by the action of nitrous acid upon ammonia caused by special bacteria, which also have the power of evolving free nitrogen from proteins, although the two processes may be chemically looked at as one and the same, or it may mean, as the name implies, the reversal of the process of "nitrification," in other words, the re-converting of nitrates—the ultimate form of nitrogen as a plant food—into organic nitrogenous compounds. In the first case, the nitrogen is lost to the manure, and in the second, the rate of availability is lessened.

**Prevention.**—Overheating can be prevented by packing the mass well, either by the constant treading of the animals, by wheeling the carts with the additional loads constantly over, or by loading on soil or turf. In addition, the heap should be kept in a moist condition by preventing the escape of liquid, as indicated in a previous paragraph. Attention to these points ensures a minimum of air entering, and so slows down the processes of oxidation, fermentation and decomposition, avoiding undue loss, although it is an impossibility to prevent it entirely. A comparison often employed in this connection is that between "banking" up a fire of coals, by packing and moistening, and on the other hand, constantly stirring it, allowing air to enter freely.

**Conservation.**—During the last two decades or so, a great deal of attention has been directed to the question of avoiding losses of nitrogen in manure heaps by the adding of special substances as preservatives. Opinions of experts and results of researches, however, have been rather at variance as to the efficiency of these, and it is still doubtful whether any of them are thoroughly effectual or remunerative. Gypsum (calcium sulphate) is advocated because it combines with the

ammonia in the form of ammonium carbonate, thereby preventing loss of nitrogen. The idea is that calcium carbonate and ammonium sulphate are produced, but as this could only go on to a limited extent, it is very doubtful if gypsum is of much use as a preservative. Superphosphate is recommended by some American authorities on the grounds that it contains gypsum, and at the same time adds phosphates, the deficient plant food in manure, thereby obviating its separate application to the soil (1). Superphosphate, however, is known to check bacterial activity and thus interfere with fermentation, so that its value as regards nitrogen retention is counteracted; experiment has shown that the application of superphosphate to the manure heap has the effect of allowing the straw in it to remain practically unchanged. The same remarks apply to kainit, which is also frequently advocated as a preservative.

Taken all over, the best method of preventing losses of nitrogen by volatilisation, and this is now almost generally recognised, is to pack well, and cover well with loamy or peaty soil, free, of course, from seeds of weeds or germs of plant diseases. This serves the required purpose, and also allows of fermentation proceeding normally and not too rapidly.

Before the subject of losses is left behind, two other causes might profitably be called attention to:—

(1) Weeds growing on the heap not only extract a great deal of nourishment from it, but if permitted to go to seed cause endless loss and trouble when the manure is finally spread on the land.

(2) If manure is left loose and in too dry a condition, fungi develop, giving the heap a white or grey mouldy appearance, and obviously entailing further loss. This is particularly liable to occur in horse manure when left loose, and the name "fire-fanging" is the common term applied to it.

**Equality of Composition.**—As far as possible efforts should be made to have a uniform composition throughout a dung-heap, and to mix well the dung from different animals, or from animals living under different conditions. It is a bad practice to have separate heaps or separate dungsteads for, say, cattle manure, horse manure, pig manure, etc., and then to cart them separately on to the fields. The best results

both in the heap and on the crops will be obtained by a judicious mingling of all. For example, the cold dung of cattle will add moisture to the hot dung of horses, and prevent "fire-fanging"; the concentrated poultry manure spread throughout cattle manure will improve its quality, just as the richer manure from feeding cattle will invigorate and strengthen the poorer quality from young growing beasts.

**Application of Farmyard Manure.**—The old-fashioned and well-known maxim "too much of a good thing is bad," true of so many processes associated with agriculture, is no less true with regard to the application of farmyard manure. The best results have been found by experiment to be got from comparatively light uniform applications rather than from extremely heavy ones, and more of the beneficial ingredients of the dung in proportion to be used by the plants. It used to be quite a common practice to apply anything from 15 to 30 tons per acre once in a five or six-year rotation, with none in between. This, of course, is obviously bad practice, and experience and research in more recent years have shown that 2 to 10 tons per acre, supplemented by suitable combinations of artificial fertilisers, a matter to which reference will be made in a later paragraph, depending, of course, on the quality of the manure, the soil, and the particular crop, applied each third or fourth year when conditions are suitable, are ample and to be preferred.

On light sandy soils, it is advantageous to apply well rotted manure rather than that only partly decomposed, and it is well to apply it just before the crop is sown. The reason is that the short straws and fibres of well decayed manure tend to firm up these open soils, whereas the long, undecomposed fibre in fresh manure tends rather to open up a soil. Further, if the manure is put down too long before the plant is able to avail itself of the soluble matters, then they tend in these soils to get rapidly washed down out of reach by heavy rains.

In heavy soils, clay or otherwise, on the other hand, it is far better to apply much fresher dung, a considerable time before the crops need its substance. The undecomposed, long straws open up these stiff soils, loosen them, and so aerate them, and help to drain them; decomposition of the manure takes place actually *in* the soil, having its effect on

the organic, and also on the mineral constituents of the soil themselves, and so effecting a change in them from a dormant to an active condition, just as bad fruit placed among good fruit has the effect of causing the latter also to become bad.

The old habit of putting out the manure on the fields in small heaps and leaving for days, even weeks, is not to be recommended, as making obviously for uneven distribution, and serious loss by volatilisation. If, of course, the heaps are immediately spread, the practice is free from objection. The best method of all is undoubtedly to spread evenly over the land, using a manure spreader if available, direct from the dungstead, and plough in as soon as possible.

**Farmyard Manure and Fertilisers.**—Farmyard manure has often been referred to as a "perfect" manure, but, valuable as it certainly is, the term "perfect" cannot be applied to it, for, although it is a "complete" manure, it is an ill-balanced one. Wherever and however it is made, it always contains too little phosphoric acid in proportion to nitrogen and potash, and in South Africa in particular, where our cattle feed on phosphate-deficient grasses, the lack of phosphate is extremely marked. For this reason, it is always advisable to supplement it with some readily available phosphate, such as superphosphate. Without this reinforcement crops are inclined to develop more towards leaves and stalks rather than to grain, owing to the comparative excess of nitrogen and potash. Further, as the supply of farmyard manure is not usually sufficient to meet the demand, an additional reason is found here, for it has been calculated that one ton of average manure, supplemented by 40 to 50 lbs. superphosphate, will produce nearly the same increase in yield as two tons of manure (1).

The reinforcement of superphosphate may be made either to the manure in the dungstead or it may be mixed with it just before applying to the land, but, as observed before, there are reasons which render the former course inadvisable, unless it is done shortly before spreading. Another method is to drill or broadcast the superphosphate at the time the crop is planted, on land which has already been manured.

**Residual Effect.**—In addition to all the immediate virtues of farmyard manure, the residual effect must also be taken

into consideration, and this is not the least of its good qualities. Although the plant food of the liquid matter is practically all used up during the first year, that contained in the solid matter and the litter extends over several years, and becomes gradually available as the organic matter decomposes. An interesting experiment carried out in this connection at Rothamsted, extending over almost half a century, is worthy of mention. For twenty years consecutively an application of 15 tons per acre of farmyard manure was made to a barley crop. At the end of that time, and for twenty years thereafter, no manure was given, and even in the fortieth year from the beginning of the experiment, the yield was heavier than the original yield from an unmanured control plot.

The following are useful guides with regard to the application of farmyard manure to the commoner crops in this Colony:—

*Maize.*—Well-rotted kraal manure at the rate of 4 to 8 tons per acre, supplemented by the addition of small dressings of superphosphate, say, 100-200 lbs. per acre, should prove very suitable manurial treatment.

*Tobacco.*—Kraal manure must be thoroughly rotted before use, and is particularly valuable for fire-cured tobacco, but generally speaking, it tends to give too coarse a leaf with flue-cured type. It should be spread over the land a few months before transplanting and before ploughing.

*Cotton.*—No recommendation can be given, as our information is not yet complete, but experimental work on the subject is now being conducted by the research officers at the Cotton Breeding Station at Gatooma.

*Ground Nuts.*—The nitrogen in kraal manure is apt to retard the formation of nuts, so it is advisable to use it on previous crops in the rotation, rather than on the ground nut crop itstlf.

*Wheat.*—The manure should be well rotted before application, and should be applied at the rate of about four wagonloads to the acre, in conjunction with light dressings (say 100-150 lbs.) of phosphatic fertilisers.

Very much more could be said about the advantages which will inevitably accrue from the preparation and the

correct use of farmyard manure, but space does not permit. What has been said, in fact, only touches the fringe of the subject, but if these notes have the effect of influencing even one more Rhodesian farmer towards making more use than hitherto of this valuable material, the writer will feel that he has indeed attained his purpose. It should always be remembered that by utilising to the best advantage all available manure on the farm, a considerable economy in the purchase of artificials may be effected, and at the same time the occasional use of farmyard manure will greatly increase the benefits derived from the use of artificials.

## REFERENCES AND ACKNOWLEDGMENTS.

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Grateful acknowledgment is also made to Mr. A. D. Husband, A.I.C., Chief Chemist, for valuable suggestions and criticism.

# Ground Nuts for Export.

With effect from the 1st February, the Beira and Mashonaland and Rhodesia Railways rate 13 on actual weight will apply to ground nuts pressed to a density of not more than 80 cubic feet to the ton of 2,000 lbs., instead of 50 cubic feet per ton as previously.

# Suggested Crop Rotations for Tobacco Growers.

By D. D. Brown, Chief Tobacco Expert.

The need for suitable crop rotations on tobacco farms has long been realised in Southern Rhodesia. Varying climatic conditions and soil requirements preclude any general rotation scheme being drawn up to serve the needs of the entire Colony. The following crop rotations are suggested for the benefit of those tobacco growers who are desirous of instituting crop rotation in their farming programme. Some modification may be required to render these proposed schemes more suitable for local conditions and individual requirements.

The basic principle underlying all these rotations is crop production in conjunction with maintenance of soil fertility. In deciding upon the inclusion of any crop in a rotation, it is necessary to consider the effects on soil fertility and the influence on following crops grown. Consideration must also be given to the number of cash crops, their market value, market demand and their suitability under local climatic conditions.

The influence of any crop in reducing or improving the fertility of the soil is usually apparent in the behaviour of subsequent crops produced, provided, of course, that adverse seasonal conditions are not experienced. The same also to some extent applies to the incidence of disease and insect pests relative to the crops produced. The influence of other crops on the quality of the tobacco is not so easily discernible, and, being more in the province of scientific research, is not within the scope of these notes.

The question of the frequency of cash crops, green manuring crops, market values and so forth can only be decided upon by the farmer himself, as he alone is fully conversant

with the amount of capital available and the time and capital which can best be spared in building up the fertility of his land. In the crop rotations outlined, it will be noted that virgin land is specified in the first instance; this is desirable, though not absolutely essential. Where no virgin land is available the tobacco grower can introduce a rotation scheme, say, after the tobacco crop grown for the second year in succession. Broadly speaking, the main idea is the production of two successive crops of tobacco, followed by a cash crop to use up residual value of fertiliser applied during preceding seasons, or, as in some cases, a soil improvement crop to be ploughed under. In the case of a cash crop being grown in the third year, the green manure crop is planted and ploughed under in the fourth year. A leguminous crop such as the velvet bean should be followed by maize or similar crop, as it has been generally found to be advisable to reduce the nitrogen content, supplied by the legume, before planting out the next crop of flue-cured tobacco.

An ideal rotation scheme suited to all crop requirements and climatic conditions has not yet been evolved, and until such time as more suitable crop rotations have been established through exhaustive experiments the adoption of any suitable one stated here or the continuance of any rotation schemes giving satisfactory results in present use is recommended.

*Rotation No.* 1.

Four Year Course Rotation.

1st year—Tobacco—virgin land in first instance.

2nd year—Tobacco.

3rd year—Legume (velvet bean, dolichos bean, sunn hemp, Niger oil) ploughed under.

4th year—Maize (or some similar crop).

*Rotation No.* 2.

Five Year Course Rotation.

1st year—Tobacco—virgin land in first instance.

2nd year—Tobacco.

3rd year—Ground nuts.

4th year—Legume (as suggested in Rotation No. 1).

5th year—Maize (or similar crop).

*Rotation No.* 3.

Five Year Course Rotation.

1st year—Tobacco—virgin land in first instance.
2nd year—Tobacco.
3rd year—Cotton.
4th year—Legume (as suggested in Rotation No. 1).
5th year—Maize (or similar crop).

*Rotation No.* 4.

Five Year Course Rotation.

1st year—Tobacco—virgin land in first instance.
2nd year—Tobacco.
3rd year—Legume (as suggested in Rotation No. 1).
4th year—Maize (or similar crop).
5th year—Grass crop (Sudan grass, oats or similar crop).

*Rotation No.* 5.

Five Year Course Rotation.

1st year—Tobacco—virgin land in first instance.
2nd year—Tobacco.
3rd year—Maize.
4th year—Legume (as suggested in Rotation No. 1).
5th year—Maize (or similar crop).

*Rotation No.* 6.

Five Year Course Rotation.

1st year—Ground nuts—virgin land broken late in season.
2nd year—Tobacco.
3rd year—Tobacco.
4th year—Legume (as suggested in Rotation No. 1).
5th year—Maize (or similar crop).

*Rotation No.* 7.

Six Year Course Rotation.

1st year—Tobacco—virgin land in first instance.
2nd year—Tobacco.
3rd year—Cotton.
4th year—Legume (as suggested in Rotation No. 1).
5th year—Maize (or similar crop).
6th year—Ground nuts.

*Rotation No.* 8.

Six Year Course Rotation.

1st year—Tobacco—virgin land in first instance.
2nd year—Tobacco.

3rd year—Cotton.
4th year—Legume (as suggested in Rotation No. 1).
5th year—Maize (or similar crop).
6th year—Grass crop (as suggested in Rotation No. 4).

*Rotation No.* 9.

Seven Year Course Rotation.

1st year—Tobacco—virgin land in first instance.
2nd year—Tobacco.
3rd year—Ground nuts.
4th year—Grass crop (as suggested in Rotation No. 4).
5th year—Tobacco.
6th year—Legume (as suggested in Rotation No. 1).
7th year—Maize (or similar crop).

*Rotation No.* 10.

Seven Year Course Rotation.

1st year—Tobacco—virgin land in first instance.
2nd year—Tobacco.
3rd year—Grass } Land left fallow and veld grass
4th year—Grass } ploughed under during second year.
5th year—Tobacco.
6th year—Legume.
7th year—Maize (or similar crop).

In all of the foregoing schemes, it is essential that adequate dressings of suitable fertiliser be applied to each tobacco crop grown. The manurial treatment of other crops grown in the rotation will be governed by circumstances dependent on type of crop, soil and the financial resources of the individual concerned.

In conclusion, it may be stated that after the rotation has reached the final year stated, it may be found that two successive crops of tobacco will cause a lower quality leaf being produced in the second season. This can only be ascertained by actual experience on each individual farm, and should a marked decrease in quality be demonstrated, it would then be necessary either to substitute some other suitable crop in place of tobacco in the second year in order to preserve the continuity of the rotation period or as an alternative to reduce the period by one year.

# Farm Forest Practice in Southern Rhodesia.

*Issued by the Forest Service.*

## II. CHOICE OF SITE AND PREPARATION OF LAND.

The preceding article was concerned with the raising of planting stock. Actually it should have followed the present article, but, as the period was at hand during which coniferous seed should be sown, it was considered advisable to disturb the sequence in order that intending tree growers might be given advice well beforehand.

**Choice of Site.**—The choice of the planting site is of the utmost importance. It should give way only to the object in view in planting trees, and to the requirements of the major farm crops. From a true forestry point of view the main object of tree growing is the production of timber. All other objects, such as the growing of trees for their minor products, as protection belts against erosion, as windbreaks, shelter belts or for ornament, are of subsidiary importance. From other points of view, however, it may well be that any of the subsidiary objects mentioned will be the foremost reason of the tree-grower for establishing trees.

In choosing the best site for timber trees the following guiding principles should be borne in mind: A tree, to grow, must have soil of ordinary fertility and sufficient moisture available, to enable the roots to carry out the function of absorbing the dissolved salts, which are in turn carried to the leaves, where the food of the plant is manufactured. Furthermore, moisture must be available to the roots even during the dormant period. The significance of this platitude will be appreciated when it is realised that during at least four, and sometimes even seven, months of the year

practically no rain falls over the greater portion of the country, and the soil is exposed day after day to the heat of a tropical sun.

With the cessation of the summer rains the water table gradually sinks, and continues to do so well into the next rainy season. If, then, impermeable strata of rock or hard "pans," *e.g.*, of laterite, are near the surface of the ground, it is obvious that the shallower the layer of soil covering these impermeable strata, the sooner will it dry out during the dry season. The very simple yet fundamental requirement for successful tree growth is, therefore, *a depth of soil sufficient to carry moisture available to the roots of trees throughout the dry season.* The experience of the past two drought years has even shown that, when the planting of trees on a large scale and as a commercial enterprise is contemplated, the foregoing axiom must be further qualified by the statement that the soil should be able to carry the required moisture over *two* dry seasons.

It is obvious that such factors as the proximity of perennial streams, seepage from irrigation channels and other artificial aids to moisture conservation would allow of a lesser depth of soil being used than would ordinarily be the case where dependence is placed solely on the rainfall. It therefore becomes possible further to postulate that the depth of soil should be inversely proportional to the quantity of water—usually rainfall—available during the year.

The question now naturally arises as to the means by which the depth of soil may be gauged. A railway or road cutting, a well, an old quarry or a donga caused by erosion give volumes of evidence to the observant eye. None of these, however, may occur in the locality intended for tree planting, and it rests with Nature, with the presence or otherwise of trees, either indigenous or exotic, to afford the clue. Eye observation may be supplemented by the digging of a few trial "pits."

Generally speaking, the depth of the soil is reflected in the height growth of the trees it carries. Trees which are stunted and have low spreading crowns indicate a shallow soil, while trees with a good length of bole and a well-balanced crown, especially the "Mujakata" or "Muhacha"

(*Parinarium mobola*), and even the well-known "Musasa," are sure soil indicators.

The seepage zones at the bases of hills are often conspicuous by the heavier indigenous growth which appears in such localities, and this growth will generally afford a valuable indication that deep soil and adequate moisture are available for the successful establishment of trees. When the object, therefore, is the production of high quality timber it is clear that the portions of a farm having the deepest soils should be selected for the purpose.

It has been stated already that the objects in view in tree planting will often arbitrarily determine the planting site. Thus, trees grown for ornament near a homestead or along an avenue may often have to contend with harsh soil conditions. This disadvantage may, however, be largely counteracted by the fact that these trees may receive individual attention which is impracticable in a regular plantation. In the same way trees which are grown for windbreaks and shelter belts are often given no choice of soil, as their primary function is not to produce large, straight-grown timber. If they produce crooked and inferior timber, and if gaps caused by drought have often to be filled, they nevertheless fulfil the main object of protection which is required of them.

**Stream Bank Plantations.**—In the past too little attention has been given to the practicability of growing trees along Rhodesian stream banks. Even the casual observer cannot have failed to notice that most streams in this Colony carry some form of fringing forest on their banks. This is particularly noticeable in hot, dry localities, with shallow rocky soils which ordinarily carry sparse and stunted indigenous tree growth. The presence of moisture from these streams and the usually rich though limited alluvial soil in the vicinity are obviously the factors which allow of good tree growth in an otherwise unfavourable locality. It is not untrue to state that many farms, particularly in the drier parts of this Colony, can offer no other site for commercial tree-growing than the banks of such streams as may traverse them. It is the experience of the Forest Service that many tree-planting novices are under the impression that plantations will not produce good trees unless they cover a broad

expanse. This is entirely erroneous, for with stream bank plantations it matters not that the area suitable for trees is usually confined to a narrow strip on either bank, as long as that strip will support good tree growth.

**Tree Planting in Vleis.**—The problem whether "vleis" are suitable for tree growth is one which continually confronts the farmer, who naturally considers that he will be saved heavy stumping expenses if he can utilise his open "vlei" land, which often carries a rich soil. The absence of tree growth in these "vleis" is in some instances accounted for by the fact that during the rainy season the soil is water-logged and insufficiently aerated to support tree growth, while during the winter months it dries out into hard, obstinate cakes. In other cases shallow soil is often also a contributory cause. In the case of deep "vlei" soils, drainage is the obvious remedy to sweeten the soil and permit of freer movement of water. The expense of this and the danger of starting serious erosion are, however, usually serious obstacles to the farmer. It is the practice of the Forest Service accordingly to advise farmers to seek higher, well-drained ground for their trees, even if stumping would incur the same expense as drainage. The higher, well-drained soil, even though fringing the "vleis," is in a better position to carry trees safely through bad drought years. Despite their disadvantages, "vleis" are capable of supporting tree growth if the practice is followed of planting only the hardier trees and confining the plantings to the higher margins of the "vleis." The trees so established will themselves act as drainage agents, so that as the seasons progress future plantings can be made further down into the depressions if these are not otherwise required for pasture.

The absence of tree growth in parts of the country does not necessarily indicate that the soil is incapable of supporting trees. The grasslands of the high elevations of the eastern border of the Colony are a notable example. These grasslands, which occur in the regions of high rainfall, usually cover very deep soil. Indigenous high forest in these localities shows signs of encroaching on the grasslands, which have already been proved to be eminently suitable to the growing of first-class timber of high quality and quantity yield.

It will be observed that so far no mention has been made of the kind of soil upon which to grow trees, for the reason that adequate depth of soil with its resultant water conservation far outweighs in importance the physical and chemical properties. Other things being equal, however, preference should be given to sandy soils over red soils and red soils over clay.

The remaining factors in determining the choice of site are aspect and frost localities. Where possible, eastern and southern aspects should be preferred, as they are less subject to the intense heat of the sun's rays. In the higher altitudes of the eastern border this rule may be departed from in the case of tender, warmth-loving trees. Localities subject to heavy frosts should ordinarily be avoided, unless trees of proved frost-hardiness are utilised.

**Preparation of Land.**—The farmer needs little advice on how to prepare his land, but it is within the scope of this article to point out some of the methods adopted in forest practice.

It is wise to choose virgin land for the establishing of trees. Soils which have carried several field crops, unless they are properly treated, become "worked out" and are deficient in the organic matter so essential to the life of the tree. Virgin land in this Colony is usually covered with some woody growth, and this means that stumping is necessary, and steps should accordingly be taken to remove all undesirable shrub, tree or growth from the area to be treated. It is only necessary to stump trees to a depth slightly greater than will be pierced by the plough. Where the soil is to be tilled by means of the hoe, mattock or spade it is desirable to clear-fell the existing growth to ground level, but only to remove the roots of the smaller trees and shrubs, leaving the stumps of the larger trees. Piling the waste wood on these stumps, and burning it, frequently prevents any coppice growth taking place.

Land for planting should be stumped a year in advance. All wood should be utilised as far as this is possible, but the smaller branches which are not utilisable should be piled and burned. Efforts should be made to conserve on the soil the fallen leaves and other accumulated organic matter.

The next operation is a thorough ploughing or discing of the land, usually in late summer. Deep cultivation is both unnecessary and undesirable, for the whole object is to loosen and aerate the surface soil, and turn in all grass, dead leaves and other vegetable matter available. In the following summer the ground should be cross-ploughed or disced, and later still—just prior to planting—a good harrowing should be given. The ground is now ready for planting.

The sites for the trees to be planted may be marked on the ground by means of a planting chain. The planting chain may be a long piece of wire marked with tags at the required planting distances, usually 6 feet. Where planting operations are to be carried out year after year a more serviceable form of planting chain is obtained by linking ordinary plain fencing wire to the required planting distance. The chain may be a hundred yards or more in length. It is secured at both ends by a stout stick. The chain is used in the following manner:—

A labourer at one end of the chain holds his stick (or preferably a pitchfork) firmly in the ground. At the other end another labourer holds the stick in both hands, and by means of a movement of the arms describing a semicircle and ending by a jerk of the wrists, he imparts to the chain an undulating tautening motion, which ensures that the line is parallel to the base line. A gang of labourers then marks on the ground by means of small sticks placed against the tags or links the sites for the plants. The process is repeated until the whole field is marked with planting sites.

On hillsides which have a gradient too steep to allow of the use of an ordinary plough or disc, a hillside plough throwing one-way furrows may often be used. In such cases, however, it is usually safer to risk only one complete cultivation, as the rougher the tilled surface the less will be the danger of erosion. At the time of planting a small space is levelled, with a hoe or spade, for each plant. When the configuration of the ground on hillsides is too steep or broken for the use of any plough, tillage by hand should be resorted to. As in the case of ploughing, hoeing should take place some months before planting to allow the vegetable matter to rot and the soil to sweeten.

As no mechanical cultivation can subsequently be carried out, there is, however, no object in endeavouring to secure a rigid formality in planting distances. For this reason the planting sites may be marked by labourers, armed with sticks 6 to 7 feet long. The labourers proceed either in line or échelon fashion from a given base line, moving forward the distance of the stick and keeping their place in relation to their neighbours by the same means.

In localities where harsh climatic conditions prevail, and the establishing of trees depends largely on the amount of tillage which the soil has received, it is best to dig holes for all plants in addition to ploughing. These holes should be at least 12 inches square and 12 inches deep, care being taken to fill in only good top-soil mixed with well rotted organic matter. The deeper the hole and the better the soil with which it is filled, the greater will be the tendency for the roots of the young plants to strike deep, and be within reach of the moisture which is more certain to be present in the lower than the surface layers of the soil.

On steep grassy slopes in the zone of high rainfall of the eastern border, where soil erosion is frequent, complete tillage should be avoided. Patch hoeing or picking should be resorted to. Patches 3 to 4 feet square, depending on the density of the grass or weed growth, should be hoed over during the winter months and planted with trees in the following summer.

In a general way a tree planter has a wide choice of methods of soil preparation. In using any one method he should bear in mind the fact that the better the soil is prepared the greater is the chance of a good stand of trees.

## Notice.

In order to avoid delay in replying to correspondence, the public are requested to address officers of the Department of Agriculture by their designation and not by name.

# The Dairy Industry of Southern Rhodesia.

## COMMON DEFECTS IN BUTTER-MAKING.

By T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert, and J. R. Corry, B.Sc. (Agr.), Assistant Dairy Expert.

Defects commonly found in butter may be divided into three classes:—

1. Defects in flavour and aroma.
2. Defects in body and texture.
3. Defect in colour.

1. **Defects in Flavour and Aroma.**—The true flavour of high-class butter is very difficult to define. Butter should have a delicate, nutty, clean flavour pleasing to the palate. Defects in flavour are variously described, but those most common other than good can be described as insipid or flat, stale, cheesy and curdy, yeasty, bitter, mouldy or musty, rancid and tallowy.

*Insipid or Flat Flavour.*—Butter which is lacking in flavour, but which is otherwise free from objectionable flavours or taints, is termed flat or insipid. This is one of the commonest defects of butter, and is generally caused by one or more of the following:—

1. Lack of green or succulent feed, especially in the winter.
2. Ripening cream at too low a temperature.
3. Excessive washing of the butter whilst in the granular stage.
4. Excessive dilution of the cream with water for churning.

Butter which is under-salted frequently has an insipid taste; salt in moderate and correct proportion always brings out the delicate flavour and improves the appearance of the butter by deepening the colour. Butter made from sweet, unripe cream usually has a flat flavour and is often classed as insipid. To bring out the full flavour and aroma, the cream should be ripened for two or three days in summer and from four to five days in winter. In creamery practice the desired flavour and aroma may be obtained by the use of a good starter.

*Stale Flavour.*—Staleness is generally characteristic of butter made from old, stale or over-ripe cream, or it may be caused by the use of cream obtained from the milk of cows far advanced in lactation. A more frequent cause, however, is the use of rusty cream receptacles such as petrol and paraffin tins. The use of these as cream containers is only too common and bad results follow, as the acid quickly eats away the thin coating of tin. Paraffin tins are most unsuitable vessels for cream ripening, and their use for this purpose cannot be too severely condemned.

*Cheesy and Curdy Flavours.*—These flavours are generally caused by decomposition of the protein matter or curd (derived from butter milk) retained in the butter owing to faulty washing. This is a defect common during the summer, when it is almost impossible to make butter on the farms without the use of ice. If such butter is maintained at ordinary summer temperatures, the flavour goes "off" in two or three days, and if stored any length of time becomes absolutely obnoxious. To avoid the development of this cheesy flavour, it is necessary to use all available means to get the cream and washing water as cool as possible. Placing the cream in a flat enamelled dish and exposing it and the washing water to the night air often has the effect of bringing down the temperature to 60 degrees. At this temperature, if churning takes place early in the morning, a reasonably good grain can usually be obtained and the butter milk washed out. The cream must obviously be kept overnight in a safe place which animals or fowls cannot reach. Cheesy butter is often full of white specks. These are particles of curd which are incorporated in the butter either through neglecting to strain the cream when it is put into the churn

or by over-churning the butter. In the latter case it is obviously impossible to get rid of the butter milk and portions of hardened curd by washing.

*Yeasty Flavour.*—This is not a common defect in butter made on the farm, because the cream is not kept long enough to allow the yeasty fermentation to develop. A yeasty flavour in cream sent to the creamery is, however, only too common during the hot weather. Such cream is always classed as third grade, for it is impossible to make any other grade but cooking butter from it.

The fundamental cause of yeasty and foamy cream is the presence in cream of yeast cells. During December and January these organisms are particularly prevalent, and the conditions of high temperatures which then obtain are very suitable for their development. When on the farm or in transit to the creamery, the cream is maintained at a high temperature, the development of the yeast cells becomes very pronounced and is invariably accompanied by a vigorous formation of gas, and this either causes the lids of the cans to blow off or the cream to froth over. This is a common enough sight at almost any of our railway sidings or stations during the summer months. A yeasty cream is a seasonal phenomenon occurring almost solely during the summer months; it is obvious that high temperatures are the principal cause. It is, therefore, necessary to cool the cream as soon as separation is complete, and to keep the cream cool pending its despatch to the creamery or its manufacture into butter. Another fruitful cause of yeastiness in cream is an unclean separator. Too much is left to natives, and in too many cases the separator is not properly cleaned after each separation. A dirty separator will cause any cream, however treated, to be absolutely unfit for making into a first-grade butter.

*Bitter Flavour.*—This flavour has been noticed very frequently when draughty conditions were prevalent. At these times cows are usually to be found grazing in the vleis where the herbage is usually of a rank, sedgy nature. This grazing apparently causes bitterness in the milk and cream; a bitter flavour may also be caused by certain feeds and weeds, and it is frequently found in the milk and cream obtained from cows far advanced in lactation. Cream which

is not sufficiently stirred while ripening is also prone to develop an unpleasant bitter taste. Bitterness in butter, however, is probably most commonly caused by the use of impure salt containing comparatively large amounts of magnesium and calcium compounds. Most of the colonial salt is of this nature, and where butter is made for storing, either on the farm or in the factory, nothing but imported salt should be used.

*Mouldy or Musty Flavour.*—A mouldy or musty flavour in cream and butter may be caused by feeding mouldy and musty feeds. Cream which is ripened in a closed can or other receptacle on which a lid has been placed, generally develops a peculiar musty flavour which may subsequently appear in the butter. This defect is most readily prevented by prompt cooling and frequent stirring of the warm freshly separated cream; the latter should be exposed to the air as much as possible whilst cooling and ripening, and this is best achieved by placing a piece of butter muslin over the mouth or opening of the receptacle or vessel containing the cream. This precaution will also be effective in preventing the formation of mould. Cream should at all times be kept in a cool airy place. Too many dairies in this country are used for other purposes than that of storing cream; harness, meat, potatoes or dirty sacks are often stored in the "dairy," and as often as not the walls are deficient as regards whitewash. Any dark, dusty, unventilated place is conducive to the formation of mould; the latter will not develop if the dairy is kept thoroughly clean and the walls frequently whitewashed.

Mould is often caused by the use of cheap unsuitable boxes for butter, such as soap boxes, etc. If these boxes are at all damp or are kept in a damp place for any length of time, mould is almost certain to develop. Thick inferior butter paper is another frequent cause of mould. When such paper is used, it is generally necessary to moisten the paper before wrapping the butter. In this case a strong brine solution should be prepared by dissolving 6 to 7 lbs. of salt in a couple of gallons of water. This solution is then heated to boiling point and the butter papers immersed and left in the solution overnight.

Mould growth is also encouraged by the practice of wrapping damp cloths round butter with the idea of keeping it cool. If these cloths are not removed, within a comparatively short period black spots of mould will appear. When butter is meant to be stored on the farm, the paper should be put on dry, and the butter should be kept in as dry and cool a place as possible.

*Rancid Flavour.*—A rancid flavour is usually to be found in butter which has been stored for some time, although badly made and badly stored farm butter made in the hot weather often turns rancid within a week. Rancidity is the result of decomposition of the butter fat, a process usually brought about by organisms present in the butter. In India butter, because of high temperature and bad water, becomes rancid very quickly, and for cooking purposes especially it is the custom to melt the butter and pour off the clarified butter fat, which is known as "ghee." That the heat destroys the germ life present in the butter is obvious, so that if we can, by careful treatment of the cream and thorough washing, eliminate as far as possible all germ life and nitrogenous matter, we should be able to make butter which, if not exposed to the air and to variations in temperature, will keep sweet for a considerable period.

*Tallowy Flavour.*—Tallowy butter has a distinct taste and odour of spoiled tallow, and is usually bleached in colour or entirely white. Tallowiness generally develops in butter stored at room temperatures, and is therefore a defect more commonly found in farm butter than in the creamery product.

Tallowiness is generally considered to be caused by decomposition of the butter fat, a process which is encouraged by exposure of the butter to air, light and warmth. These conditions are generally satisfied when butter is kept for any period on the average farm or in stores, etc., and for this reason tallowiness is a defect common to much of our farm produced butter.

The use of old, rusty dairy utensils, cans, etc., also favours the development of a tallowy flavour in butter. Tallowiness can be almost entirely avoided by handling the cream in non-rusty cans, etc., and by storing butter under conditions where it is not unduly exposed to the air, light, heat, etc.

2. **Defects in Body and Texture.**—Properly made butter has a firm, solid "body" and a consistently waxy, close texture. When the butter is first formed in the churn it makes its appearance in the shape of minute irregular granules. In the subsequent process of manufacture, if the butter is properly made, these granules never completely lose their individuality, and they constitute the so-called granular appearance which is noticeable when the butter is broken. The more distinct the granules, the better the texture. When the butter is cut, no particles of fat should adhere to the knife.

*Weak Body.*—This is a common fault of butter made in the warmer season of the year, but even in the winter weak-bodied butter, because of overworking, is only too common. The fundamental cause of a weak body is neglect to cool the cream adequately previous to churning. Butter fat is composed of a mixture of fats of different melting points, and it is obvious that although some of these fats may be chilled, others may be in a semi-liquid state. It is these semi-liquid fats which cause a weak-bodied butter. If this defect is to be avoided, it is essential to hold the cream at a low temperature for some considerable time. Rapid cooling to churning temperature and immediate churning is ineffective and is the cause of much of our creamery butter being weak in body and greasy in texture at normal temperatures.

When it is impossible to reduce the temperature of the cream to a sufficient degree, churn the butter carefully, adding plenty of breaking water, and allow the butter granules to harden in brine made with the coldest water obtainable. By this means it can be handled and worked without serious danger of its becoming greasy.

Soft butter should never be worked. It should be placed in a flat dish covered with a damp muslin cloth, and exposed to a draught until such time as it is hard enough to be worked and made up.

In summer it is very advisable to churn a thin cream on the farm. Such cream can be more easily churned at a high temperature than a cream testing 40 per cent. or over. Thick cream requires prolonged cooling, so that every particle can be thoroughly chilled, and this, as a rule, without the use of ice, is an impossibility.

3. **Defects in Colour.**—The colour of butter must be of the shade and intensity desired by the market in which it is sold. For local purposes a medium shade is required.

It is generally accepted that the natural colour of cream and butter is derived from certain yellow pigments which accompany the chlorophyll or green colouring matter of plants. While most green feeds, yellow roots, etc., contain these pigments in abundance, they are generally lacking in dry feeds and concentrates. This explains why the colour of butter in spring is of a much deeper shade than that of butter made in the winter, when the cows are being fed largely on dry hay or mealie stalks, supplemented with mealie meal, bean meal or other concentrates. It is remarkable how well-got hay, with the original green colour still retained, maintains the colour of the butter in the winter. Such hay is, of course, of much higher feeding value than the dried grass which is so commonly cut in this country.

The breed of cattle also affects colour. It is well known that the Jersey and Guernsey breed give highly coloured cream even in winter, whilst that of the Shorthorn and the Friesland, under similar conditions, is almost white.

*Dull Colour.*—The dull and lifeless colour which is frequently noticeable in butter is invariably the result of overworking. If the butter is overworked to such an extent that the grain is destroyed, the fat loses its bright colour and the butter has a dull appearance; by careful working of the butter this defect can be avoided.

*Mottled or Streaky Butter.*—Mottles and streaks are quite common defects in South African butter. They are usually caused by (1) unequal mixing of creams of different stages of ripeness; (2) by unequal working of the butter; (3) by insufficient washing or over-churning whilst the butter is in the granular stage; (4) by the unequal distribution of salt throughout the butter. The remedies are obvious. Different creams should be well mixed and allowed to stand for some time before being churned. Care should be taken to avoid over-churning, and the butter granules should be thoroughly washed; brine salting should be practised where possible, and the butter must be evenly and completely worked. If dry salting is practised the salt should be of the best quality and finely ground. It should be evenly distri-

buted through a hair sieve over the butter whilst it is still in the granular form, and is better applied in two lots, half at a time, to allow of a more thorough incorporation in the butter. This latter practice is not recommended in very warm weather, as the longer the butter is kept unworked, the softer it becomes.

**Artificial Butter Colouring.**—The use of artificial butter colouring (annatto) is perfectly legitimate if the proper preparation is obtained. The butter maker should not be tempted to use cheese colour for butter-making, or *vice versa*, as these preparations are only to be used for the particular purpose for which they are designed.

The amount of artificial colour that must be added varies greatly under diverse conditions and it ranges from one drop to one pound of butter to an average of five drops to every pound of butter fat in the churn. These figures can only be regarded as approximations, but every standard make of butter colour gives full directions for use on the bottle. As already mentioned, the colour demanded in this country is of medium shade, and due care should be taken in the use of artificial colouring to achieve this desired colour.

**Salting.**—The amount of salt required varies according to the demands of the trade. Usually, if brine salting is adopted, the holding of the butter whilst in the granular stage for half an hour in a brine of one pound of salt to one gallon of water will give the required degree of saltness. If not, a small portion of salt can be added through a dry sieve whilst the butter is in the granular stage on the worker. If dry salting is practised, the correct proportion varies from half an ounce to one ounce of salt per pound of butter. The salt should be distributed over the butter whilst the latter is in the granular stage, or it can be with advantage applied in two equal portions at an interval varying from two to three hours. If either of these practices is adopted and the salt is finely ground and well distributed, very few, if any, streaks or mottles should develop.

When salting down butter for the winter, see that the salt is thoroughly well ground before being incorporated in the butter. Many samples of salt butter contain so much dissolved and unincorporated salt that on tasting it small pieces of salt grate upon the teeth. This is a fault which is

always severely penalised. The remedy is obvious. Only the best brands of imported salt should be used, and these should be in a fine state of division before being used.

**Appearance.**—Farm butter should be made up in pounds which are uniform and neat in appearance. The paper should be of the best quality. Nothing detracts so much from the appearance and finish as a heavy dark looking paper. The butter should be marketed in a properly constructed box. Much loss is occasioned in warm weather by the use of boxes without divisions for each pound. A flat shaped box containing two layers of butter is to be preferred to a deep shape containing five or six layers.

## SUMMARY.

### To avoid Defects in Butter.

1. Build a cool sanitary dairy. Keep it clean, and whitewash the walls frequently.
2. Use suitable vessels for storing cream. Do not use petrol or paraffin tins for this purpose.
3. Provide succulent feed and green stuff for the cows, especially in the winter.
4. Keep the cream as cool as possible in summer and at a temperature of 60 degrees in winter. Very low temperatures cause cream to develop a bitter flavour.
5. Churn at least every three days in summer and every four days in winter.
6. Do not over-churn the butter.
7. Wash the butter twice whilst in the granular stage with the coldest water obtainable.
8. Do not store the butter in a damp, dark place.
9. Do not work the butter whilst soft. Spread out the grains on a plate, cover it with a damp muslin cloth and expose it to a draught.
10. Be careful not to overwork the butter. This spoils the texture and makes it greasy.
11. Use brine for salting. The brine hardens the grains of butter and renders it easier to obtain a good texture.
12. If dry salt is used, it should be of the best quality, well ground and evenly distributed.
13. Make up the butter neatly. Use only the best vegetable parchment for wrapping.

# The Poultry Industry.

## SCARCITY OF EGGS: CAUSES AND REMEDIES.

By A. LITTLE, Poultry Expert.

[*This article appeared in the* Rhodesia Agricultural Journal *for July,* 1926, *but despite what was then written and has since been spoken, there is still a scarcity of eggs at this period of the year. For this reason we think it advisable to repeat in this issue of the Journal the advice previously given. The Poultry Expert enumerates four main causes for the seasonal shortage, each of which he emphasises can be overcome by employing the measures he advocates. We commend the article to the careful perusal of poultry keepers.—Ed. R.A.J.*]

From December to April every year there is, as both producer and consumer know to their cost, a big drop in the output of eggs. The writer has over and over again contended, both verbally and in writing, that this scarcity should not occur, and given reasons and the remedy therefor. The whole matter is in the hands of the producer, and he it is who is to blame for this scarcity.

The matter is purely one of treatment of the birds. In the following notes an endeavour will be made to enumerate the causes of the scarcity and the measures that should be adopted to eliminate it and provide a comparatively uniform production the year round.

**Causes of Scarcity of Eggs.**—A bird that is allowed to get wet during the rainy season, especially if she goes to roost with wet feathers, will, unless she is a particularly good layer, in the best of health and possesses a strong

constitution and vitality, stop laying, and may not re-commence for some time.

The so-called scarce season also corresponds to the moulting period. The best layers often lay through their moult and produce eggs and feathers simultaneously, but the far greater majority—i.e., the medium and poor layers—do not.

Sufficient pullets have not been hatched early enough to be in full lay during the moulting period of the older birds and so take the place of these in producing eggs; or those pullets that have been hatched early have not been so treated and brought along to lay when they should. Light breeds, such as Leghorns, Minorcas, etc., should start to lay at five to five and a half months old; heavy breeds, such as Rhode Island reds and black Orpingtons, etc., at six to six and a half months old.

These are the three reasons for the great scarcity of eggs during a certain time of the year, and poultry keepers should realise that they themselves are to blame, not their birds, for this scarcity. The oft-repeated assertion that one cannot expect eggs during the period December to April, or that the birds are resting and that it is unnatural for them to lay at this time, is utter nonsense. A little extra care, attention and treatment during the period mentioned on the part of poultry keepers is all that is necessary to eliminate this scarcity.

**Remedial Measures.**—No bird should be allowed to get wet, and certainly not allowed to go to roost with wet feathers. A waterproof, dry house should be provided, with a good depth of scratching litter on the floor. During wet weather the birds should be confined to this shelter and kept busy scratching for their grain. Of course, they must be fed on a proper ration to produce eggs and have everything they require for comfort, health and production. Too often people who pen up their birds do not realise that the food given to them must be similar in quality and quantity to what they were previously getting in their pens or on free range; for instance, they cannot get grit or green food in the house as they were doing on free range if it is not supplied to them. The same applies to everything else.

As mentioned above, some birds will lay through their moult. These are the best layers, and should always be kept for breeding from. They are the birds, too, that eat enough food to produce eggs simultaneously with the growth of feathers. The reason some birds stop laying during the moult is that the food which formerly was used to produce eggs is used during the mould to produce feathers, but if the bird is given some extra food, especially of an oily nature, e.g., stewed linseed mixed with bran to a crumbly consistency, more sunflower seeds, a little flowers of sulphur (which helps feather growth) in the dry mash, and chiefly cabbage, cauliflower leaves or rape as green food, eggs and feathers will then be produced simultaneously in the majority of cases.

If the bird does not lay through her moult (it chiefly depends upon whether she is of a good or poor laying strain), this treatment will assist her to get through it quickly and come on to lay again.

Many birds, due to lack of attention and proper treatment, sometimes take months to get through the moult, with no eggs and continued expense in feeding as the result. A bird can, with proper treatment, be through her moult and be laying again within from five to six weeks of its commencement. If during the moult a bird gets wet or is in a damp house, she will be thrown back and continue to "hang in the moult" for weeks.

Early hatched pullets should not be forced in any way; growth is assisted by feeding more grain than mash. Maize is said to help more than any other grain. By feeding more grain than mash there may not be so many eggs collected from the flock, but the body continues to grow naturally to its full development, after which the ratio may be narrowed. Some advocate feeding grain in troughs, so as to do away with the extra bodily labour involved in scratching in deep litter. By this method of feeding, if the moult be avoided, the total eggs would be greatly increased, and many of them would be laid during the scarce time of the year. A pamphlet on the moult and its treatment can be obtained gratis on application to the Poultry Experts, Department of Agriculture.

Hatching to produce pullets to lay when the older birds are going into moult is a matter where very many poultry

keepers fail. The birds usually begin to moult in December, some even commencing in November; therefore the pullets should be in full lay in the latter month. Light breeds, if treated properly from their chickenhood, should commence to lay in five or six months; the heavy breeds in from six to seven months. Give a month to bring them into full lay; this means six to seven months and seven to eight months respectively. Therefore the majority of light breeds should be hatched in April, May, June and July, and the heavy breeds in March, April, May and June. Readers should realise this, and act upon it, and so get eggs when they are most required. Possibly some of these earlier hatched pullets may go into a partial moult, but they will not unless some change has been made in the feeding, housing, arrangement of nests, etc., or sudden change in the weather.

# Protection of Bee Hives from Badgers.

In our last issue we published an enquiry as to whether jackal-proof wire netting would protect bee hives from badgers. Mr. T. W. Savory, who contributes the notes on bee-keeping to this Journal, writes as follows:—

Replying to your note as to the honey bear or ratel in the apiary, I have found the following plan so far to quite stop any damage they might cause, and there are several on the farm. The apiary here is fenced in (as all should be in some way) by the usual six foot fowl netting on posts six feet apart. These are fastened down by an ordinary wooden peg like a tent peg every two feet, and if dipped first in solignum they will last much longer. If this is properly done and now and again looked to to see that they are in order, I do not think there is any fear to be worried by these animals, though of course they are strong enough to bite through the netting were they wise enough to know their strength. Where the door is placed, a large flat paving or river stone should be laid down, or better still, have a few burnt bricks properly paved; this will stop the ratel from burrowing under the door.

# Mycological Notes.

## TWO COMMON DISEASES OF POTATO TUBERS IN RHODESIA.

By J. C. F. Hopkins, B.Sc. (Lond), A.I.C.T.A.
Chief Botanist and Mycologist.

1. **Sclerotial Disease.**—This disease of the tubers is known under various names, such as *Rhizoctoniose*, *Rhizoctonia* disease and locally as scab or black scab. It is unfortunate that the last two synonyms have come into general use, since two other more serious diseases are known throughout the world by these designations. The former is usually used in referring to common or corky scab (*Actinomyces scabies*), whilst by black scab is meant wart disease, neither of which is present in Rhodesia.

Sclerotial disease is so called from the small coal-black bodies which are typically produced upon the surface of the potato. These structures are knotted masses of the fungus *Rhizoctonia solani*, which by its action upon the skin of the tuber may also cause a pitting or canker, similar to insect injury, and from which the local name of scab has been derived. The latter manifestation of the disease is of common occurrence in this Colony. Frequently sprouts from infected tubers are attacked by the fungus and a brown rot occurs which may kill the growing point. Such sprouts appear to have been chewed off by insects. On older sprouts the rot may not completely encircle them, but may cause depressed brown lesions which prevent the downward passage of elaborated food substances from the leaves to the roots, and usually results in the production of a large number of small tubers, whilst the vines are abnormally large. Occasionally on such plants aerial tubers are formed in the axils of the leaves.

Another form which the disease may take on elongated pointed-end tubers is a black jelly-like decay. Until recently this "jelly-end rot" was thought to be due to other fungi, but it is now known that *Rhizoctonia* initiates the decay, which is completed by saprophytic organisms which enter later.

As can easily be realised, sclerotial disease is carried over from year to year on "seed" potatoes. Control measures therefore aim at selecting as far as possible disease-free tubers and then soaking in poison as an added precaution. Corrosive sublimate is recommended for this purpose and should be used at the strength of four ounces of crystals to thirty gallons of water. The crystals should be dissolved in a little hot water in a wooden barrel (metal receptacles must not be used), and the solution made up to strength with cold water. The potatoes are allowed to soak for an hour and a half and dried thoroughly after treatment to prevent injury from the poison. The temperature of the solution should not be allowed to exceed 70° F. and a fresh lot should be made up after three batches of potatoes have been steeped. The seed should never be soaked *in the sacks,* since dirt as well as the sacks quickly weakens the solution.

2. **Internal Browning.**—Probably the most common tuber disease in Rhodesia is that known as internal browning, or more commonly brown fleck. Other names are used in different parts of the world, including internal rust, sprain, internal brown spot, net necrosis, etc. Very little was known about the disease until recently, and much confusion has arisen as a result of this lack of knowledge. However, in November last, an article appeared (1) which throws considerable light upon this affection, so that a few notes here will not be out of place in view of the importance of the disease to potato growers.

For the purpose of simplicity the name brown fleck will be retained, although the author of the work referred to has designated two distinct diseases under the names of (1) sprain or internal rust, (2) corky bacteriosis, the former of which is much more important and causes a much larger percentage of damage. Sprain is characterised by the appearance of rusty brown isolated spots,* streaks or irregular

* These spots turn hard and black when cooked.

blotches, in which frequently are to be found cavities of varying size. The spots often run together to form large decayed areas, which may occupy most of the centre of the potato. Corky bacteriosis is confined to the veins of the tuber and in cross section appears as isolated brown spots near the skin or as a complete rusty brown circle.

Previously these diseased areas were thought to be due to some physiological disturbance in the growth of the tuber and were referred by some workers to the action of a virus, since similar discoloration is associated with virus disease. It has now been shown that sprain and corky bacteriosis are due to two distinct bacteria, and the reason for the increase in amount of disease during storage is explained. The points of interest for growers are that sprain, certainly, and possibly also corky bacteriosis have their origin in the soil. Light sandy loams deficient in organic matter are a serious source of infection, and soil which has borne a brown flecked crop will be likely to transmit the disease from year to year. It has also been shown that bacteriosis can be transmitted from the seed to the crop in the soil, but the degree of disease produced in this manner would appear to be slight for sprain. However, as both these diseases are extremely common in this Colony, and may be classed together as brown fleck, it is apparent that from the farmer's point of view there is danger in using flecked seed. Soil which has produced the disease should be put under rotation for some time and endeavour made to increase the organic matter or humus by manuring and ploughing in green crops.

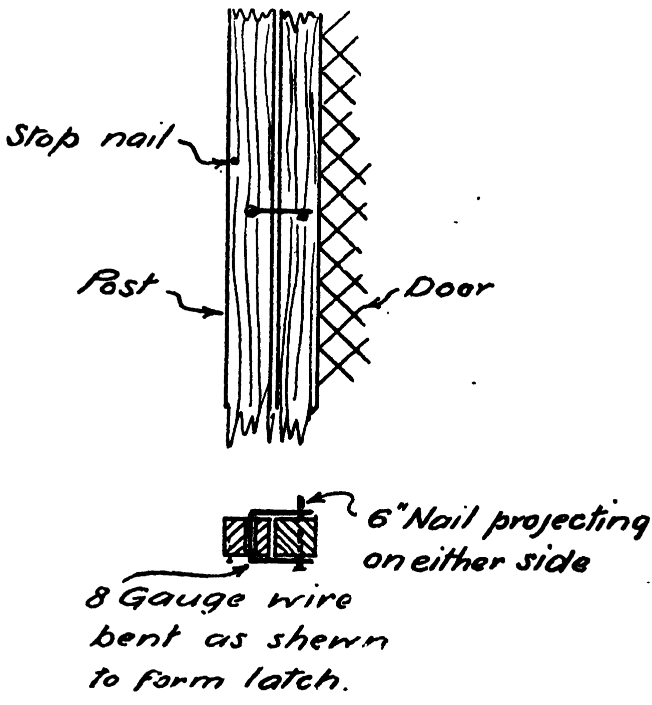
## REFERENCE.

(1) Burr, Sydney.—Sprain or Internal Rust Spot of Potato. *Ann. App. Biol.*, xv. 4. Nov., 1928.

# Three Labour-Saving Devices.

By "XXX."

**Mealie Crib.**—The ordinary mealie crib, made of bush poles, proves most unsuitable, having to be renewed or remade every year. The cribs, as shown in the accompanying sketch, will take up to a thousand bags of mealies, and will enable them to be handled efficiently for shelling and grinding. The cribs are made of three parallel brick walls, the outer ones having 14 in. square pillars built at intervals of 10 feet. Second-hand rails of a suitable length are built into




Door latch for poultry runs.

# Three I

**Mealie Crib.**—
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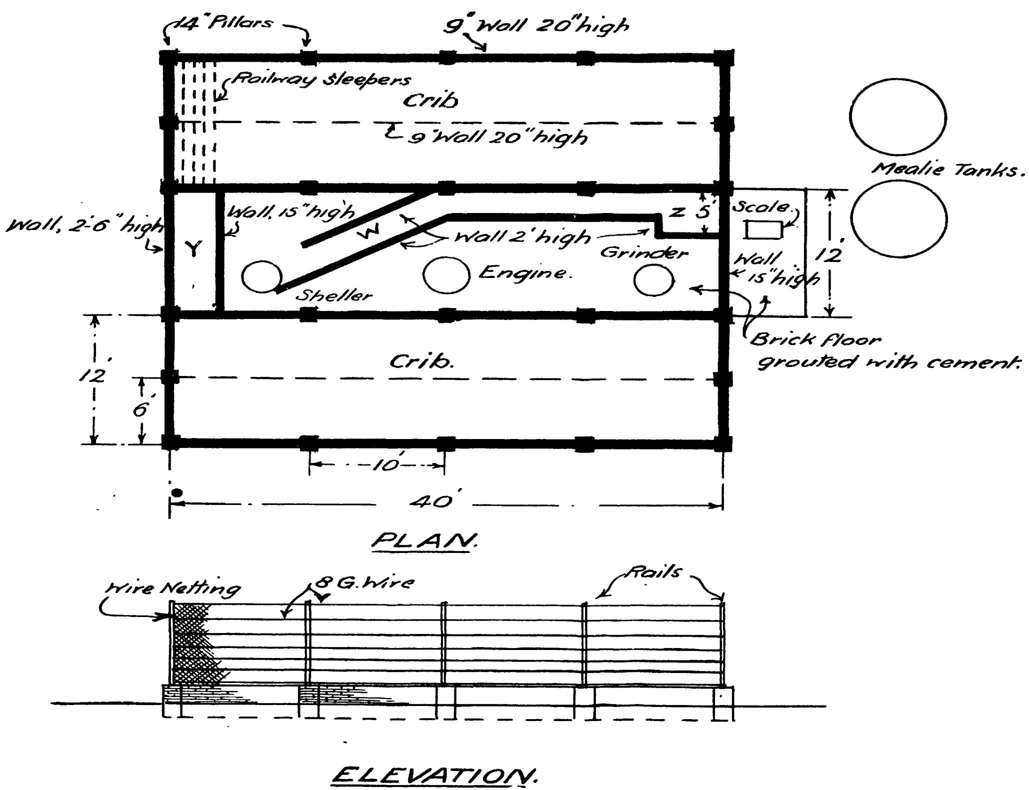
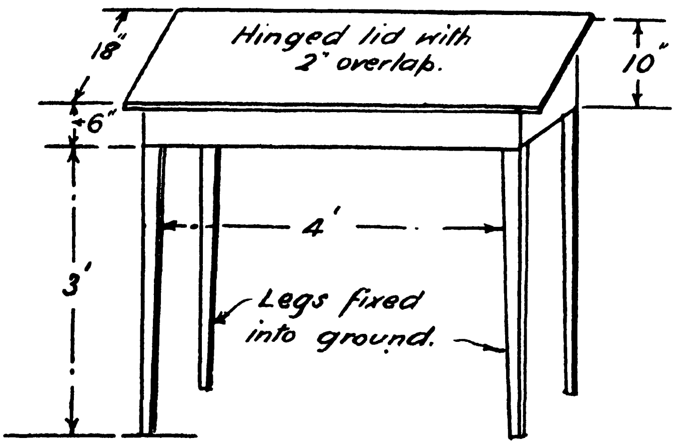



MEALIE CRIB.

Mealies from cribs are placed in trough "Y" for shelling. The shelled mealies are then shovelled along trough "W" to the space "Z," from whence they can be passed on to the scale platform for bagging, over to the mill for grinding, or to the storage tanks.

the centre of each pillar with cement, so that they project vertically about 8 feet. These rails may be bought from the Railway Company at 1s. 1d. per foot delivered at any station or siding. Old railway sleepers, which can also be obtained from the railways at 1s. 1d. each, are laid close together across the walls, as shown in sketch, to form the floor. On top of these, 2 in. wire netting is placed to prevent the cobs from falling between them. Pig netting is fixed round the rails and is supported by 8 gauge fencing wire, which en-




Salt Box for Cattle.

circles the rails and passes through holes drilled therein at vertical intervals of 18 inches. The floor between the two cribs may consist of concrete or bricks grouted with cement, the foundation for the engine, grinder and sheller being made of concrete.

When the mealies are to be shelled, the cobs are thrown by natives into the brick trough "Y," from whence they are fed to the sheller. The shelled maize is shovelled along the trough "W" to the space "Z." From here it can be bagged and weighed or fed into the mealie tanks. If it is desired to grind some of the maize, it can be left in the space "Z" until shelling is finished, when it can be passed to the

mill for grinding, and from there to the scale platform for bagging and weighing.

**Door Latch.**—Much time is wasted on many poultry farms by the use of awkward latches on the gates of the runs. The accompanying sketch explains itself; the latch is very simple and efficient and costs practically nothing. A piece of eight gauge wire is used, bent into a U-shape and passed through a hole in the door post. The door can then be opened and closed from either side.

**Salt Box for Cattle.**—The sketch reproduced herewith shows clearly the dimensions of the box. It can be made of crate wood. It should have the legs treated with Atlas "A," which is the only efficient protector against white ants, and then the whole box should be carbolineumed. The lid swings right back, but can be closed for protection against rains.

## Publications Received.

From the National Institute of Roumania for the Utilisation of Power Resources, four reports on research work relative to re-active power, sinusoidal currents, power transmission lines, canalisation of the cataract section of the Lower Danube and general coincidents of the use of the lignites and coals of Roumania.

# Jam-Making.

By Miss D. Bosman, Home Economics Officer, Division of Agricultural Education and Extension, in *Farming in South Africa.*

Fruit, unless preserved in some way, is attacked by bacteria, which cause it to rot. The preserving agent used in jam-making is sugar, for bacteria do not thrive in a heavy sugar syrup.

**Sugar-Inversion.**—The addition of sugar to cooked fruits also increases the nutritive value of the fruit, while the cooking of the sugar at a high temperature in conjunction with the acid in the fruit, brings about the inversion of the sugar, which is the first step in its digestion.

The old method in jam-making was to allow 1 lb. sugar to 1 lb. fruit and then cook to set; but this has been altered.

**Pectin.**—Fruit contains a substance called pectin, and this pectin and acid, combined with sugar, form a jelly. If any of these are absent or the proportions are incorrect, the jam will not set properly.

Pectin is present in the cell-walls of fruit, and the skins are also rich in it—for instance, those of apples and quinces. As pectin is in the cell-walls, it is necessary to break up the fruit in order to bring the pectin into a soluble condition. In over-ripe fruit the pectin is changed into some other substance, therefore fruits used for jam-making must not be over-ripe. Also, if fruits are heated at high temperatures, the pectin is decomposed; hence if the jams are boiled too long they will not set. This takes place more quickly in the presence of an acid. The first thing to do then, when making jam, is to put the fruit on to cook, so as to break the cells and bring the pectin into solution.

**Hard Fruits.**—In the case of hard fruits, we use some water, in an insufficiency of which the pectin would not be able to dissolve. Use just sufficient water to prevent the fruit from burning. In the case of quinces, half as much water as fruit must be used, otherwise the jam will be too firm. When soft, juicy fruits are used, such as grapes and strawberries, a few are crushed to form moisture and no water is added. Nor is any water added to apricots, for, after being washed and halved, sufficient water will be found clinging to the skins, and, as soon as it is gently heated, the fruit will draw its own juice.

After the fruits have been cooked till tender, the sugar is heated in the oven and added little by little so that the jam does not go off the boil. The quantity of sugar used depends on the quantity of the pectin present. It is, therefore, necessary to make the pectin test as follows:—

Cook fruit and strain a little of the juice through a muslin cloth. Take one teaspoonful of the liquid, allow it to cool and add two teaspoonfuls of methylated spirits to it. Move around to mix juice with spirits, then pour off spirits carefully, leaving precipitate in glass. If the set juice drops out in a solid clot, the fruit is rich in pectin and the quantity of sugar is adjudged accordingly. For instance, when the clot is used, 1 lb. 2 ozs. and even as much as 1¼ lbs. of sugar is allowed to 1 lb. fruit. If the clot is weak, that is, when it comes out in pieces, concentrate the fruit by boiling, and use ¾ lb. sugar to 1 lb. fruit.

**Acid Content.**—The acid content of fruits is very important in jam-making. Some fruits are poor in acid, and, therefore, require the addition of lemon juice or tartaric acid, e.g., apples, figs, guavas, peaches, cherries. The proportion of tartaric acid to be used is one level teaspoonful, or the juice of one large lime or two lemons, to every 3-4 lbs. of fruit. The acid also improves the flavour and brightens the colour of the jam.

Add the acid at the commencement, in order to break down the cell-walls and to set the pectin free. No acid is added to pineapple, as it has a peculiar property which clashes with other acids.

**Sugar.**—Never use cheap sugar, because all the impurities rise to the surface in the form of scum, and the more of this skimmed off, the more jam is wasted. Best white, granulated sugar should be used. The quantity of sugar depends on the pectin clot. The more pectin, the more sugar, and a safe rule to remember is that for all fruits from which it is not possible to make jelly, e.g., apricots, pineapples, figs, strawberries, etc., only $\frac{3}{4}$ lb. of sugar should be used to every pound of fruit.

As soon as the sugar is added, the jam should be boiled as rapidly as possible. If the fruit has been cooked too long with the sugar, the jam has a brownish tint. Crystallisation is also due to too long boiling. When finished cooking the jam must come off in flakes and not in drops from the sides of a wooden spoon. Stir jam now and then to prevent it from burning.

**Bottling of Jam.**—Fill the jam either boiling hot or perfectly cold into hot, dry jars, right to the top. Put a circular piece of paper, dipped in brandy, on top and screw the lids on tightly. Hot, melted paraffin-wax may also be poured over the paper before screwing on the lids. Label and store in a cool place.

**Jam-making by Weight.**—Jams often ferment because too much moisture is present, and, to make sure that it contains 60 per cent. sugar, which quantity is necessary to its keeping quality, the jam should be made to weight. The weight of finished jam is arrived at by multiplying the quantity of sugar by $\frac{5}{3}$ ($\frac{100}{60}$), e.g., 6 lbs. apricots, $4\frac{1}{2}$ lbs. sugar, weight of the finished product $\frac{9}{2} \times \frac{5}{3} = \frac{45}{6} = 7\frac{1}{2}$ lbs.

In making the jam by weight, first weigh the preserving pan—which must be either porcelain or enamel-lined—cook fruit with or without water, according to the nature of the fruit, boil until tender and pulp is thick, then add sugar and cook until the correct weight is attained. The weight of the pan must be added to the finished weight of jam, and the spoon should be removed. The sugar in the jam remains the same—the difference is due to the evaporation of water.

When the jam is the correct weight, fill at once into hot, dry bottles, to the top, and seal as described above.

**Unsatisfactory Results in Jam-making.**—Fermentation is caused by: (a) Too little sugar; (b) too much boiling.

Crystallisation is caused by: (a) Too much sugar; (b) too much boiling; (c) too much stirring when boiling.

Mildew is caused by: (a) Putting jam in wet bottles; (b) fastening down when luke-warm; (c) insufficient sealing; (d) storing in a damp place.

## REFERENCES.

1. The Science of Canning and Preserving, by Jeanette C. van Duyn.

2. Household Cookery, by Mary Higham.

# Weather Forecasts.

Arrangements have now been made for the controlling officers of all telephone exchanges to telephone the weather forecasts to subscribers, subject to the payment of a call fee of 3d. on each occasion.

# Bilharzia (Human Redwater) Disease.

*Issued by the Public Health Department of Southern Rhodesia.*

Bilharzia disease, properly called Schistosomiasis, is due to a small worm called Schistosoma and occurs in various forms according to the variety of worm involved.

In Africa there are two forms: (1) urinary, in which the disease attacks the bladder, occurring throughout Africa; and (2) intestinal, attacking the lower intestine and occurring chiefly in North and Central Africa. The disease is usually due to bathing in infected water.

The worms are about three-quarters of an inch in length, and live chiefly in the abdominal veins of the body. The female lays her eggs in various organs (bladder wall, liver, appendix or intestinal wall), causing chronic inflammation there, to which the symptoms of the disease are due. The eggs eventually escape through the wall of the bladder or intestine, as the case may be, and are voided with the urine or stools. If these eggs gain access to water they hatch out into a small larva (miracidium). These larvæ are harmless to man. They swim about until they reach certain kinds of snails, whose bodies they penetrate and infect. These snails are small spiral fresh water kinds, about half an inch in size, and may be found attached to stones, rushes, posts, etc., in shallow streams or ponds. After the larvæ have undergone certain changes in the snail's body for four to six weeks, they develop into large numbers of tadpole-shaped larvæ (cercariæ), which escape from the snail and swim about in the water. These cercariæ are infective to man. They can only live a couple of days in the water unless they come in contact with man or a susceptible animal, in which case they bore their way through the skin of his body or mouth, and

eventually reach the abdominal veins, where after six to twelve weeks they become full-grown worms and repeat the cycle of events just described. The worms live for many years in the body, laying eggs from time to time.

**Symptoms of the Disease.**—(1) In the urinary form there may be itching or perhaps nettlerash within half an hour of the infective bathe. After some months there may be some fever, illness, cough and pain in the abdomen. Later on a little blood is passed in the urine, with some pain at the end of passing urine, but this symptom may be so slight that it is not noticed. After some years the disease may die out, but often progresses and causes more serious symptoms, and the patient becomes thin and anæmic. There are chronic inflammations of the bladder, kidneys, appendix, brain, etc., stone in the kidney or bladder, retention of urine, occasionally cancer and sometimes death.

(2) In the intestinal form there are symptoms like dysentery, namely, diarrhœa, blood-stained stools and pain, but without fever. The disease may progress rapidly, with severe pain and illness, and may end in death from exhaustion.

**Treatment.**—Fortunately the disease is curable, but treatment must be thorough, consisting of at least 20 injections of tartar emetic (or of emetine hydrochloride in small children), given by a doctor for a period of four or five weeks.

**Prevention.**—*A. Personal Precautions.*—As most streams and ponds are likely to be infected, no one should bathe or wade in such places; if this be done inadvertently, one should dry the body at once, and if possible apply some antiseptic preparation. Water from such stream or pond should be boiled before drinking, and if used for bath water one should add 10 drops of a 16 per cent. solution of copper sulphate to each 10 gallons of water about an hour before taking the bath.

*B. General Precautions.*—All cases of the disease should be treated to rid them of infection. No infected person should urinate or defæcate in or near any water, and Native Commissioners should warn their natives (who are generally infected) not to do so.

Limited areas of water can be treated with copper sulphate (1 lb. to 160,000 gallons of water) as often as fresh

water is admitted; this is not harmful to man or cattle unless drunk frequently and in large quantity. Small ponds should be drained empty. Streams and ponds should be cleared of vegetation.

Municipal water supplies are rendered practically safe by filtration, especially if the water be stored (under conditions free from further infection) for a couple of days, as this storage kills all cercariæ.

The intake of swimming baths should be screened to exclude snails, and the water should be treated by any of the methods described above.

The following enemies of snails and cercariæ should be introduced or encouraged in all streams and ponds:—Domestic and wild duck and other water fowl, predatory fish such as trout and "millions" or "Kurper" fresh water fish.

If the snails in any area are suspected of being infected, a number of these should be placed with some wet grass in an empty tin, carefully packed and sent by first post to the Director, Public Health Laboratory, Box 145, Salisbury.

# Seed for Sale, Gwebi Farm.

Kinvarra Oats ... ... ... ... per 100 lbs. 25s.

Price is f.o.r. Gwebi. Cheques should be made payable to "Gwebi Farm." Orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury.

# Correspondence.

*[No responsibility is accepted by this Journal for the views expressed by correspondents.]*

To the Editor,

*Rhodesia Agricultural Journal.*

Sir,

## The Dairy Industry.

One was quite interested in the report of dairying in Queensland and other parts of Australia in your January issue. But reading this report and knowing how different the conditions are in this Colony and Queensland alters the matter greatly. Having several friends farming in different parts of Australia, I happen to know they are altogether in a better position to produce dairy products than we are here, and the chief factor is the attitude of their Government; they have and are giving the farmers their—what we badly need here—water. Their irrigation schemes are placing people on the land and enabling them to grow the feed so necessary if one is to produce milk. Then their rivers are not rushing spruits but real rivers, and their pasture is altogether different from ours. Paspalum grows in abundance all along their rivers. My chief argument is that until our Government place small barrages across our rivers at suitable intervals where there are farmers to enable them to have water to lead, pump or otherwise irrigate sufficient land to feed their cattle the necessary succulent food in winter, we shall never become producers of any quantity of butter or cheese.

We are informed that the Congo is a growing market for our produce. This I maintain is wrong. The people of the Congo have more sense than that; they are importing the necessary breeding stock to supply themselves, in a very few years, with all their needs in both dairy products and beef; and also employing men from here to go up and push this industry along. This also is a loss to Rhodesia—every

man who relinquishes farming down here and goes to the Congo is a financial loss to this Colony.

However, like many more things in the past, such as cotton, tobacco, Johannesburg market for meat, now Congo as a market, we seem to clutch at any straw held out, like a baby clutching at its mother's finger. Is it not time we sat down and surveyed things from a world's point of view, and looked to our one and only market, Great Britain? Money laid out (judiciously) now in providing irrigation will do more to bring prosperity to this country than all the above-mentioned products and markets dangled year after year before our eyes will ever do. Let our Government make up its mind and spend a few thousand pounds on a few barrages where the population along our different rivers warrants it, and instead of billions of tons of water and silts running into the sea, we shall have water sufficient to ensure our dairying industry becoming our stand-by. It can be done, and the sooner it is started the better. We grow majordas, we pit mealies as succulent feed, forgetting that as a feed they are worthless. Cattle require feed with nutriment in same, and what is better than lucerne, oats, barley and roots, which with irrigation can be grown here right through our winter months.

I am attaching a cutting on irrigation and settlement in Australia which I should like you to insert with this letter. If Australia can obtain this amount for settlement on the £ for £ basis from the British Government, we can surely do likewise on a moderate scale. Imagine 850,000 acres of land under crops by irrigation. What would this mean to Rhodesia? Is it not worth attempting by experimenting with a few small barrages across our rivers? Then why not get to work right now and make a start?

I am, etc.,

"BREEDER."

The cutting referred to is as follows:—

"The New South Wales Government representatives in London recently announced that the British Government has accepted the proposals for the development of the Lachlan River basin as one of the developmental works to be proceeded with under the £34,000,000 Migration and Settlement Agreement between the Imperial and Commonwealth Governments.

"The works involved in this scheme are the construction of the Wyangala Dam at a cost of £1,350,000 and the railway from Roto to Hillston at a cost of £169,000. The Wyangala Dam will ensure the provision of a water supply in the river for riparian holders along 767 miles of river frontage and many miles of frontage along creeks, which in turn will provide a regular supply for stock and domestic purposes for an area of 357,000 acres.

"Under this scheme 850,000 acres of land will now be brought under cultivation for wheat, making possible the settlement of more than six hundred farmers."

[The question of constructing weirs on rivers in certain parts of the Colony for the storage of water for irrigation purposes has not been lost sight of, and is under consideration by the Government at the present time.—Ed., "R.A.J."]

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To the Editor,
*Rhodesia Agricultural Journal.*

Sir,

**Soil Erosion.**

*Re* your excellent articles on erosion, I should say the average white farmer is alive to the danger. It is visible to me the most trouble lies at the native's door, who does not read your warning. Years ago when most of his ploughing was done by kaffir hoe, the damage was not so great; but now, when 95 per cent. of them possess ploughs, therein lies the damage. Invariably he will plough up and down the lie of the land, his throw out furrow occurring every 40 or 50 feet; this starts erosion on a grand scale on the sand veld. The sand veld to-day is heavily populated by natives, who are also over-stocked. Another cause of erosion is that the cattle are driven to dip weekly. Those dips are all on low ground, and mostly all cattle tracks lead down to them; another excellent start for erosion.

What prompts me to draw your attention to the native is that a few years ago I used to ride over a piece of country here, fairly level veld; the native got on to it and started cultivation. To-day it is a mess of dongas washed out to bed rock 20 and 30 feet deep; no horse can cross these. Now the native is beat there he looks for pastures new, repeating the operation. I admit he is a producer of a kind; after supplying his kraal and his distillery he may with luck sell

a few bags of grain. . . . A few more years at the pace we are going and I should say that Rhodesia will be in the ocean—we shall be left with the bare granite. It would be interesting to know the cubic yards or tonnage of soil which goes down stream caused by native cultivation; no one seems to know; no one seems to care.

I am, etc.,

A. ADAMS.

Filabusi.

[Although we do not consider that the larger portion of damage due to erosion is caused by the farming operations of the native, it is recognised that such activities are responsible for a very considerable growth in this evil. There is no doubt that ploughing up and down the slope of the land instead of along the contour is the cause of the formation of gullies, particularly on soils of a sandy nature. It is probable that over-stocking, to which reference is made by our correspondent, is responsible for greater damage by erosion than even ploughing up and down the slope.—Ed., "R.A.J."]

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To the Editor,

*Rhodesia Agricultural Journal.*

Sir,

## Destruction of Porcupines, Snakes and Spring Hares.

It may interest your readers to know of a most effective method of destroying these pests.

One boy must have a hoe and shovel to fill in the holes, leaving one open. At the mouth of the hole he prepares a heap of moist earth. He then ties four packets of mole and vermin fumigators to a thin stick 4 to 6 feet long, lights the cartridge and pushes it as far as possible down the hole and closes it. He then places a flag to mark the spot, so that they can be re-visited and examined. If any of the holes have been opened he can repeat the process. Out of 50 burrows closed, only some half dozen were found opened up by the porcupines, but a second dose finished them also. I mentioned this method to Mr. Waller of Bluff Hill, who also had great success. The cartridges may be purchased from local agents.

I am, etc.,

T. H. NEWMARCH.

# Movements of New Settlers.

The following new settlers arrived in the Colony during the month of January, 1929:—

V. L. C. Johnson.—Arrived from Great Britain on 30th November, 1928, and proceeded to Mr. P. Brocklehurst, Belvoir Spinney, Umvuma, for a period of training.

E. F. G. Getty.—Arrived from Great Britain on 4th January and proceeded to Mr. W. M. Simpson, Mandara, Salisbury.

A. B. Dobson.—Arrived from the Union on 9th January on tour of inspection.

A. G. J. Murray.—Arrived from St. Helena on 11th January and proceeded to Mr. Hansen, Dedsi Farm, Sinoia, for a period of training.

Mr. and Mrs. H. J. F. Reynolds.—Arrived from Great Britain on 11th January and joined Mr. Rutherford, Igava Farm, Marandellas.

G. L. Black.—Arrived from Great Britain on 14th January and proceeded to Mr. Ackerman, East Clare Estate, Que Que.

R. W. Knight and Daughter.—Arrived from Great Britain on 21st January and joined Mr. W. P. Knight, Sherwood Farm, Tsungwesi.

R. Turner.—Arrived from the Union on a tour of inspection.

R. C. Hardman.—Arrived from the Union on a tour of inspection.

# Southern Rhodesia Weather Bureau.

## JANUARY, 1929.

**Pressure.**—Mean barometric pressure was high during the month, at Umtali 0.040 in. above normal to 0.006 in. above normal at Livingstone. The pressure movements during the month were unusually interesting. A fringe of the equatorial low affected the country on the 4th, but from that date high pressure was maintained. A high of great intensity moved round the south coast and was established on the coast between Beira and Mozambique from the 8th to the 24th. The circulation established by this high was responsible for a long period of rainy weather. During this period equatorial lows were active; the first was in evidence from the 5th to the 13th; in the west an offshoot then moved round the south coast. The second low developed on the 15th and moved round the south coast. Neither of these lows moved up the east coast. The third low was of more importance. It appeared on the 19th and gradually deepened and extended to the east; on the 25th it covered the whole of Rhodesia and had displaced the high. On the 26th it was withdrawing. This continued until the 28th, when a southerly low appeared for one day on the south coast. The northerly low then extended again to the south and east, covering Rhodesia on the 30th and 31st; its withdrawal was completed again on the 1st. A high was present on the south coast from the 11th to 13th. A further high appeared on the 16th and moved inland on the 18th. This was followed by a high on the west coast on the 19th, which moved round and affected the pressure inland up to the 24th. The last high appeared on the 26th, and moved up the east coast, and was very faintly noticeable off Beira on the 29th and 30th.

**Temperature.**—The mean maximum temperature during the month was very low, varying from 9.5° F. below normal at Riverdene North (Victoria) to 0.5° F. above at Sipolilo.

The mean minimum was about normal, varying from 2.3° F. above normal at Enkeldoorn to 1.3° F. below normal at Tuli.

The mean monthly temperature was below normal, varying from 4.3° F. below normal at Riverdene North to 0.5° F. above normal at Sipolilo.

The relative humidity was everywhere above normal, varying from 22 per cent. above at Gwelo to 4 per cent. above at Shamva and Fort Victoria.

**Rain Periods.**—From the 1st to the 3rd showers were recorded in north-east Mashonaland. The weather was fine from the 4th to the 7th. The east coast high rains commenced on the 8th with a few showers; from the 9th to the 11th showers were general; from the 12th to the 14th showers fell principally in north Mashonaland; on the 15th and 16th light showers were fairly general, becoming general on the 17th and 18th. On the 19th the equatorial low was well developed in the south, and only scattered showers occurred. On the 20th the low extended to Rhodesia; showers were general and heavy in the south; from the 21st to 26th showers were general and heavy, and continued general to the end of the month, being maintained by a series of lows.

**Rainfall.**—10.1 ins. of rain were recorded, as compared with a normal of 7.1 ins. The seasonal total to date is 20.9 ins., the normal being 17.0 ins., showing an excess of 3.9 ins.

The distribution was as follows:—

| Zone. | Rainfall, ins., Jan., 1929. | Normal. |
|---|---|---|
| A | 10.4 | 6.2 |
| B | 6.1 | 5.9 |
| C | 11.0 | 7.7 |
| D | 11.3 | 8.4 |
| E | 11.9 | 8.1 |
| F | 15.2 | 13.0 |

## RAINFALL.

| STATION. | 1928-29. Dec. | 1928-29. Jan. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **ZONE A.:** | | | | |
| Bubi— | | | | |
| Bembesi Railway ... | 7.43 | 9.51 | 19.12 | 14.34 |
| Glenarton ... | 9.72 | 4.71 | 17.21 | 12.56 |
| Inyati ... | 8.91 | 14.35 | 25.52 | 15.22 |
| Judsonia ... | 7.12 | 10.15 | 18.88 | n.s. |
| Martha Farm ... | 5.00 | 9.47 | 16.33 | 10.23 |
| Nduba Farm ... | 12.53 | 10.92 | 24.92 | n.s. |
| Shangani Estate ... | 5.31 | 12.55 | 19.94 | 15.86 |
| Bulalima-Mangwe— | | | | |
| Centenary ... | 5.52 | 7.98 | 16.91 | n.s. |
| Kalaka ... | 4.10 | 7.16 | 14.95 | 11.56 |
| Riverbank ... | 4.84 | 5.83 | 13.29 | 15.28 |
| Solusi Mission ... | 3.65 | 5.09 | 11.56 | 14.62 |
| Bulawayo— | | | | |
| Fairview Farm ... | 7.62 | 7.15 | 18.82 | 13.84 |
| Keendale ... | ... | 7.53 | ... | 13.88 |
| Lower Rangemore ... | 9.56 | 8 52 | 21.54 | 14.69 |
| Observatory ... | 7.77 | 7.61 | 18.79 | 15.09 |
| Waterworks ... | 7.04 | 8.53 | 19.45 | 13.52 |
| Gwelo— | | | | |
| Brockenhurst ... | 9.97 | 6.53 | 20.52 | n.s. |
| Frogmore ... | 11.37 | 9.23 | 23.64 | n.s. |
| Gwelo Gaol ... | 9.71 | 7.73 | 21.94 | 16.12 |
| Riversdale Estate ... | 6.65 | 8.32 | 16.84 | 15.68 |
| Somerset Estate ... | 5.94 | 9.29 | 17.94 | 15.86 |
| Insiza— | | | | |
| Orangedale ... | 6.80 | 10.44 | 18.93 | 16.61 |
| Shangani ... | 9.13 | 10.39 | 21.44 | 14.76 |
| Thornville ... | 9.24 | 9.99 | 22.85 | 14.20 |
| Nyamandhlovu— | | | | |
| Gwaai Reserve ... | 5.08 | 8.86 | 19.75 | 12.11 |
| Gwaai Siding ... | 6.81 | 9.11 | 20.20 | n.s. |
| Naseby ... | 5.16 | 7.33 | 15.67 | 13.42 |
| Nyamandhlovu Railway ... | 8.67 | 4.09 | 16.45 | 15.05 |
| Sebungwe— | | | | |
| Gokwe ... | 6.95 | 11.69 | 22.38 | 17.86 |
| Umzingwane— | | | | |
| Springs ... | 6.91 | 8.47 | 19.03 | 14.45 |
| Wankie— | | | | |
| Dett ... | 8.13 | 11.90 | 23.80 | 12.46 |
| Matetsi Railway ... | 5.74 | 8.39 | 15.99 | 16.09 |
| Ngamo Railway ... | 5.12 | 7.43 | 17.04 | 14.44 |
| Rosslyn ... | 5.44 | 9.96 | 16.58 | n.s. |
| Sukumi ... | 7.83 | 13.33 | 23.84 | 15.12 |
| Tom's Farm ... | 9.09 | 15.69 | 26.25 | n.s. |
| Victoria Falls ... | 5.53 | 10.67 | 17.81 | n.s. |
| Victoria Falls Railway ... | 5.88 | 9.87 | 17.37 | 17.19 |
| Wankie Hospital ... | 4.43 | 10.73 | 16.73 | 14.28 |

## RAINFALL—(*Continued*).

| STATION. | 1928-29. Dec. | 1928-29. Jan. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **ZONE B.:** | | | | |
| **Belingwe—** | | | | |
| Bickwell ... | 7.45 | 5.73 | 14.74 | 13.26 |
| Sovelele ... | 5.53 | 8.50 | ... | 9.34 |
| Tamba ... | 4.04 | ... | ... | 11.10 |
| Wedza ... | 3.86 | 6.41 | ... | 13.70 |
| **Bulalima-Mangwe—** | | | | |
| Bruwapeg ... | 2.55 | 4.66 | 9.57 | 10.99 |
| Edwinton ... | 8.77 | 8.46 | 23.37 | 13.68 |
| Empandeni ... | 2.09 | 7.34 | 13.76 | 13.90 |
| Fallowfields ... | 3.73 | 5.34 | 12.47 | n.s. |
| Garth ... | 6.00 | 9.66 | 19.83 | 16.40 |
| Maholi ... | 6.14 | 7.10 | 18.29 | 18.33 |
| Retreat ... | 9.82 | 5 85 | 19.04 | 13.65 |
| Sandown ... | 5.04 | 8.91 | 17.23 | 13.80 |
| Semokwe Reserve ... | 1.71 | 6.03 | 10.31 | n.s. |
| Tjankwa ... | 7.21 | 9.98 | 21.42 | 16.75 |
| Tjompanie ... | 8.92 | 13.72 | 26.89 | 14.62 |
| **Chibi—** | | | | |
| Bubye ... | 1.18 | 3.01 | 5.85 | 8.30 |
| Mtendelende ... | 5.24 | 4 95 | ... | 11.28 |
| Nuanetsi Homestead ... | 5.29 | 7.42 | 16.35 | 9.54 |
| Nuanetsi N.C. ... | 5.96 | ... | ... | n.s. |
| **Gwanda—** | | | | |
| Gwanda Gaol ... | 5.25 | 7.44 | 16.24 | 13.26 |
| Limpopo ... | 6.08 | ... | ... | 8.21 |
| Mazunga ... | 3.42 | ... | ... | 10.28 |
| Mtetengwe ... | 3.64 | 2.23 | 7.80 | 6.74 |
| Tuli ... | 3.06 | 4.40 | 11.78 | 9.31 |
| **Insiza—** | | | | |
| Albany ... | 5.74 | 10.77 | 18.72 | 15.31 |
| Filabusi ... | 5.39 | 5.85 | 14.88 | 14.10 |
| Fort Rixon ... | 5.59 | 8.79 | 16.44 | 13.68 |
| Inyezi ... | 7.92 | 7.35 | 17.49 | 13.71 |
| Lancaster ... | 5.70 | 6.97 | 16.34 | 13.65 |
| Scaleby ... | 5.40 | ... | ... | n.s. |
| Wanezi Mission ... | 7.89 | 7.87 | 17.28 | n.s. |
| **Matobo—** | | | | |
| Bon Accord ... | 2.66 | 7.97 | 14.01 | n.s. |
| Fort Usher ... | 6.05 | 4.91 | 16 36 | n.s. |
| Holly's Hope ... | 3.95 | 7.28 | 15.75 | 12.43 |
| Longsdale ... | 8.87 | 6.05 | 17.68 | n.s. |
| Matopo Mission ... | 6.49 | 8.35 | 20.43 | 15.92 |
| Mtshabezi Mission ... | 4.67 | 7.40 | 17.00 | 13.70 |
| Rhodes Matopo Park ... | 7.74 | 15.60 | 26.90 | 15.39 |
| **Umzingwane—** | | | | |
| Balla Balla ... | 7.06 | 5.71 | 16.34 | 14.69 |
| Essexvale ... | 8.47 | 8.49 | 19.60 | 14.48 |
| Hope Fountain ... | 8.87 | 8.51 | 19.91 | 16.68 |

## RAINFALL—(*Continued*).

| STATION. | 1928-29. Dec. | 1928-29. Jan. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **ZONE C.:** | | | | |
| Charter— | | | | |
| Bushy Park ... | ... | ... | ... | 17.96 |
| Enkeldoorn ... | 13.24 | 15.33 | 31.46 | 18.07 |
| Marshbrook ... | 9.43 | 11.04 | 22.41 | 18.11 |
| The Range ... | 8.83 | 11.10 | 25.72 | 18.32 |
| Vrede ... | 7.90 | 11.30 | 21.06 | 18.57 |
| Chilimanzi— | | | | |
| Beacon Hill ... | 11.10 | 11.01 | 24 51 | 15.69 |
| Central Estates ... | 11.35 | 15.75 | 29.83 | 19.63 |
| Fourie's Post ... | 9.45 | 14.42 | 26.00 | 14.00 |
| Orton's Drift ... | 9.96 | 13.59 | 25.49 | 15.05 |
| Sebakwe Post ... | 8.50 | 12.48 | 22.44 | 14.98 |
| Umvuma Railway ... | 10.24 | ... | ... | 17.72 |
| Gwelo— | | | | |
| Cross Roads ... | 12.03 | 9.95 | 23.94 | 16.71 |
| Delano Estate ... | 8.59 | 9.03 | 21.14 | n.s. |
| East Clare Ranch ... | 8.43 | 10.69 | 21.49 | 17.14 |
| Forestvale ... | 8.10 | 11.58 | 25.32 | n.s. |
| Globe and Phœnix Mine ... | 7.26 | 8.72 | 19.42 | 16.82 |
| Lannes Farm ... | 7.25 | 8.34 | 17.10 | n.s. |
| Lalapanzi ... | 8.77 | 9.93 | 21.55 | 21.01 |
| Lyndene ... | 10.71 | 8.10 | 21.19 | 14.81 |
| Woodendhove ... | 10.66 | 10.16 | 24.41 | 17.90 |
| Wold Farm ... | 12.28 | 8.50 | 24.88 | n.s. |
| Hartley— | | | | |
| Ardgowan ... | 9.22 | 6.09 | 17.79 | 18.15 |
| Balwearie ... | 6.34 | 11.30 | 19 03 | 17.95 |
| Battlefields ... | 11.78 | 12.38 | 26.35 | 16.70 |
| Beatrice ... | 9.58 | 7.98 | 23.73 | 17.47 |
| Carnock ... | 5.96 | 7.76 | 20.52 | 19.21 |
| Cromdale ... | 9.06 | 10.41 | 23.56 | 18.64 |
| Currandooley ... | 9.44 | 7.46 | 19.41 | n.s. |
| Eiffel Blue Mine ... | 5.61 | 7.48 | 15.58 | 15.18 |
| Elvington ... | 11.20 | 7.27 | 24.89 | 19.26 |
| Gatooma ... | 8.27 | 8.18 | 18.36 | 18.76 |
| Gatooma Experiment Station | 6.87 | 7.36 | 15.19 | n.s. |
| Gowerlands ... | 7.48 | 9.08 | 22.57 | 18.63 |
| Handley Cross ... | 6.18 | 8.79 | 17.61 | n.s. |
| Hartley Gaol ... | 7.85 | 9.04 | 19.93 | 19.58 |
| Hopewell ... | 5.55 | 9.14 | 18.75 | 17 84 |
| Jenkinstown ... | 6.75 | 8.55 | 18.27 | 18.61 |
| Maida Vale ... | 8.40 | 7.65 | 17.89 | 16.73 |
| Meadowlands ... | 8.89 | 8.02 | 22.60 | n.s. |
| Nyadgori ... | 5.69 | 7.54 | 16.16 | 16.68 |
| Pulham ... | 8.33 | 10.55 | 22.43 | 20.83 |
| Ranwick ... | 5.84 | 6.98 | 16.36 | 19.47 |
| Sunny Bank ... | 9.40 | 7.82 | 19.29 | n.s. |
| Thorndyke ... | 6.10 | 9.14 | 17.38 | 17.48 |

## RAINFALL—(*Continued*).

| Station. | 1928-29. Dec. | Jan. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| Zone C.—(Continued) | | | | |
| Lomagundi— | | | | |
| Argyle ... | 5.74 | 11.72 | 20.90 | 20.29 |
| Baguta ... | 6.94 | 10.59 | 22.44 | 18.53 |
| Between Rivers ... | 6.09 | 8.71 | 18.17 | n.s. |
| Citrus Estate ... | 6.70 | 8.47 | 21.95 | 17.97 |
| Dalston ... | 7.49 | 8.00 | 17.77 | n.s. |
| Dartmoor ... | 6.00 | 9.62 | 16.62 | n.s. |
| Darwendale ... | 6.60 | 6.98 | ... | 17.77 |
| Dedsi ... | 8.01 | 13.94 | 25.79 | 18.62 |
| Dingley Dell ... | 5.68 | 10.18 | 18.03 | 16.16 |
| Gambuli ... | 6.80 | 13.07 | 22.85 | 20.23 |
| Hartleyton ... | ... | ... | ... | n.s. |
| Kapiri ... | 6.14 | 13.44 | 20.95 | 18.26 |
| Kashao ... | 7.05 | 7.38 | 17.43 | n.s. |
| Kenidia ... | 2.58 | 5.89 | 13.34 | n.s. |
| Mafoota ... | 9.43 | 9 33 | 20.59 | 17.38 |
| Maningwa ... | 4.58 | 14.62 | 22.31 | 19.46 |
| Miami ... | 4.18 | 15.89 | 21.05 | n.s. |
| Mica Field ... | 5.50 | 19.57 | 25.52 | 15.43 |
| Montrose ... | 6.36 | 9.45 | 20.22 | 17.10 |
| Mpandegutu ... | 5.52 | 5.67 | 15.77 | 17.14 |
| Msina ... | 6.69 | 11.38 | 20.61 | n.s. |
| Mukwe River Ranch ... | 9.63 | 14.11 | 24.75 | 18.02 |
| Nyapi ... | 5.44 | 6.95 | 18.98 | 17.30 |
| Nyarora ... | 4.92 | 12.18 | 18.79 | 16.95 |
| Nyati ... | 8.39 | 18.92 | 31.79 | 14.65 |
| Palm Tree Farm ... | 7.93 | 11.64 | 21.35 | 17.82 |
| Pendennis ... | 8.03 | 12.19 | 21.01 | n.s. |
| Raffingora ... | 12.98 | 10.19 | 24.55 | 17.87 |
| Renardia ... | 5.53 | 11.40 | 19.95 | n.s. |
| Richmond ... | 9.28 | 10.24 | 22.38 | 15.61 |
| Robbsdale ... | 9.87 | 10.51 | 23.22 | n.s. |
| Romsey ... | 9.81 | 10.83 | 23.70 | 17.29 |
| Silater Estate ... | 10.70 | 9.13 | 21.66 | 20.14 |
| Sinoia ... | 6.49 | 10.74 | 22.33 | 18.55 |
| Sinoia's Drift ... | ... | ... | ... | n.s. |
| Sipolilo ... | 13.18 | 14.30 | 29.94 | 19.07 |
| Umvukwe Ranch ... | 6.45 | 5.91 | 13.78 | 20.52 |
| Woodleigh ... | 4.70 | 6.32 | 14.84 | 18.73 |
| Yeanling ... | 6.17 | 10.28 | 17.92 | 18.21 |
| Zebra Vlei ... | 7.76 | 10.22 | 20.12 | 17.86 |
| Marandellas— | | | | |
| Rocky Spruit ... | 14.20 | 18.00 | 37.65 | n.s. |
| Mazoe— | | | | |
| Pembi Ranch ... | 10 89 | 10.62 | 23.62 | n.s. |
| Salisbury— | | | | |
| Avondale (Broadlands) ... | 5.93 | 11.04 | 20.11 | 19.55 |
| Ballineety ... | 8.76 | 8.89 | 20.86 | 17.83 |
| Botanical Experiment Station | 5.45 | 11.52 | 20.78 | 16.30 |
| Bromley ... | 6.19 | 11.19 | 22.14 | 19.45 |

## RAINFALL—(*Continued*).

| Station. | 1928-29. Dec. | Jan. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone C.—(Continued)** | | | | |
| Salisbury (continued)— | | | | |
| Cleveland Dam ... | 9.81 | 14.48 | 26.30 | 18.34 |
| Forest Nursery ... | 5.84 | 12.51 | 22.38 | 19.13 |
| Gwebi ... | 6.44 | 12.58 | 22.31 | 18.51 |
| Salisbury Agricultural Dept. | 5.24 | 11.98 | 20.63 | 16.99 |
| Sebastopol ... | 6.94 | 14.18 | 26.97 | 18.81 |
| Stapleford ... | 7.97 | 12.89 | 24.71 | 20.06 |
| Tobacco Experiment Station | 5.91 | 10.05 | 18.26 | n.s. |
| Western Commonage ... | 6.39 | 9.45 | 20.03 | 15.62 |
| Sebungwe— | | | | |
| Sikombela ... | 3.97 | 14.96 | 23.07 | 18.03 |
| Wolverley .. | 8.09 | 13.80 | 25.28 | 15.28 |
| **Zone D. :** | | | | |
| Darwin— | | | | |
| Chikoa ... | ... | ... | ... | n.s. |
| Cullinan's Ranch ... | 7.57 | 10.67 | 20.00 | n.s. |
| M'gadzi ... | 6.54 | ... | ... | n.s. |
| Mount Darwin ... | 3.84 | 10.77 | 16.20 | 18.69 |
| Rusambo ... | 4.56 | 8.57 | 14.33 | n.s. |
| Inyanga— | | | | |
| Inyanga ... | 11.70 | 16.99 | 33.81 | 21.46 |
| Juliasdale ... | 11.24 | 15.68 | 31.61 | 23.20 |
| Rhodes Estate ... | 12.97 | 18.84 | 37.92 | 24.18 |
| Makoni— | | | | |
| Ardlamont ... | 11.19 | 13.13 | 29.17 | n.s. |
| Eagle's Nest ... | 10.61 | 17.14 | 33.78 | 19.42 |
| Mayo Ranch ... | 10.86 | 11.69 | 25.29 | n.s. |
| Wensleydale ... | 9.07 | 10.60 | 24.78 | 17.36 |
| Mazoe— | | | | |
| Argyle Park ... | 11.07 | 11.85 | 25.02 | n.s. |
| Atherstone ... | 9.95 | 8.74 | 21.45 | 18.07 |
| Bellevue ... | 4.90 | 11.52 | 20.40 | n.s. |
| Bindura ... | 7.15 | 10.73 | 20.13 | 17.50 |
| Ceres ... | 8.93 | 14.37 | 27.79 | 20.78 |
| Chipoli ... | 8.87 | 9.14 | 19.14 | 18.66 |
| Citrus Estate ... | 7.00 | 10.17 | 22.22 | 19.32 |
| Craigengower ... | 10.02 | 8.42 | 24.71 | 18.84 |
| Dandejena ... | 11.54 | 11 76 | 27.18 | n.s. |
| Donje ... | 10.57 | 13.47 | 26.63 | n.s. |
| Frogmore ... | 8.33 | 9.75 | 21.40 | 19.05 |
| Glen Divis ... | 9.82 | 11.33 | 24.65 | 20.95 |
| Glen Grey ... | 7.61 | 10.84 | 22.33 | 18.94 |
| Great B ... | 4.23 | 12.38 | 19.82 | 18.79 |
| Hinten ... | 8.80 | 8.61 | 19.10 | n.s. |
| Horta ... | 11.54 | 8.74 | 23.55 | n.s. |
| Kilmer ... | 10.05 | 9.29 | 25.10 | 19.55 |
| Kingston ... | 10.82 | 12.53 | 26.91 | 20.88 |
| Maienza ... | 11.55 | 14.39 | 29.27 | 19.31 |

## RAINFALL—(*Continued*).

| STATION. | 1928-29. Dec. | Jan. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| Zone D.—(Continued) | | | | |
| Mazoe (continued)— | | | | |
| Mazoe Dam ... | 5.22 | 8.53 | 17.34 | 17.85 |
| Mgutu ... | 7.07 | 15.03 | 24.59 | 21.44 |
| Muripfumba ... | 6.60 | 11.61 | 22.23 | 16.37 |
| Omeath ... | ... | 8.89 | ... | 19.06 |
| Pearson Settlement ... | 5.81 | 13.17 | 22.03 | 18.66 |
| Riversdale Estate ... | 6.81 | 9.69 | 19.95 | n.s. |
| Ruia ... | 11.43 | 10.96 | 24.92 | 20.39 |
| Rustington ... | 10.14 | 13.55 | 25.73 | 15.74 |
| Shamva Mine ... | 9.54 | 11.07 | 23.76 | 19.43 |
| Stanley Kop ... | 4.08 | 8.50 | 18.29 | 17.35 |
| Sunnyside ... | 7.61 | 9.52 | 22.13 | 19.28 |
| Teign ... | 8.79 | 9.88 | 23.89 | 19.61 |
| Usk ... | 9.64 | 12.87 | 26.53 | 20.27 |
| Virginia ... | 9.66 | 10.65 | 25.38 | 18.40 |
| Visa ... | 8.55 | 9.02 | 21.08 | n.s. |
| Woodlands ... | 8.37 | 12.49 | 25.41 | 18.27 |
| Zombi Farm ... | 10.88 | 11.22 | 25.21 | 20.47 |
| Mrewa— | | | | |
| Maryland ... | 8.70 | 8.48 | 21.79 | n.s. |
| Montclair ... | 10.43 | 10.33 | 25.60 | n.s. |
| Mrewa ... | 11.02 | 14.69 | 27.43 | 20.40 |
| Nyaderi Mission ... | 7.27 | 6.34 | 17.71 | n.s. |
| Selous Nek ... | 8.43 | 9.06 | 18.74 | 21.39 |
| Mtoko— | | | | |
| Makaha ... | 10.33 | 10.37 | 24.68 | 20.10 |
| Mtoko (N.C.) ... | 11.43 | 7.71 | 22.69 | 18.23 |
| Salisbury— | | | | |
| Arcturus ... | 9.22 | 13.40 | 28.75 | 20.26 |
| Chindamora Reserve ... | 4.72 | 10.99 | 20.00 | 20.28 |
| Datata ... | 10.00 | 13.04 | 29.06 | n.s. |
| Glenara ... | 5.49 | 13.11 | 21.01 | 19.88 |
| Goromonzi ... | 10.89 | 10.47 | 27.25 | 21.35 |
| Hatcliffe ... | 4.95 | 12.60 | 20.66 | 19.71 |
| Hillside (Bromley) ... | 6.59 | 13.01 | 24.53 | 19.96 |
| Kilmuir ... | 11.16 | 14.07 | 30.53 | 20.99 |
| Meadows ... | 10.02 | 14.75 | 28.93 | 22.51 |
| Pendennis ... | 5.74 | 14.96 | 23.72 | n.s. |
| Selby ... | 8.27 | 15.84 | 27.66 | 17.75 |
| Springs ... | 7.05 | 14.04 | 26.54 | 19.46 |
| Teviotdale ... | 4.85 | 14.83 | 22.56 | n.s. |
| Vainona ... | 7.07 | 15.25 | 25.15 | 19.11 |
| ZONE E. : | | | | |
| Belingwe— | | | | |
| Belingwe (N.C.) ... | 9.63 | 5.23 | 15.53 | 13.27 |
| Doro ... | 8.68 | 5.22 | 15.41 | 12.99 |
| Shabani ... | 11.13 | 6.41 | 18.99 | 13.33 |

## RAINFALL—*(Continued).*

| STATION. | 1928-29. Dec. | 1928-29. Jan. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE E.—(Continued) | | | | |
| Bikita— | | | | |
| Angus Ranch ... | 6.67 | 4.11 | 12.71 | 12.22 |
| Bikita ... | 5.25 | 10.38 | 17.78 | 18.66 |
| Devuli Ranch ... | 8.09 | 5.16 | 14.23 | 13.30 |
| Pamushana ... | 10.19 | 11.25 | 23.11 | 21.69 |
| Charter— | | | | |
| Buhera ... | 6.55 | ... | ... | 21.77 |
| Chibi— | | | | |
| Chibi ... | 11.09 | 8.63 | 20.53 | 14.21 |
| Lundi ... | 12.22 | ... | ... | 12.75 |
| Mpapas ... | 9.10 | ... | ... | 10.67 |
| Chilimanzi— | | | | |
| Allanberry ... | 10.19 | 11.14 | 23.98 | 17.89 |
| Driefontein ... | 11.22 | 12.52 | 25.65 | 17.15 |
| Felixburg ... | 10.21 | 11.63 | 23.37 | 16.77 |
| Grootfontein ... | 14.59 | 11.14 | 27.42 | 16.88 |
| Induna Farm ... | 12.51 | 7.57 | 23.05 | 20.39 |
| Mtao Forest ... | 11.16 | 8.83 | 21.96 | 17.26 |
| Mukowries ... | 13.61 | 16.23 | 33.88 | n.s. |
| Thornhill ... | 12.54 | 15.63 | 29.50 | n.s. |
| Gutu— | | | | |
| Alheit Mission ... | 7.94 | ... | ... | 14.93 |
| Chindito ... | 8.74 | 16.37 | 30.13 | n.s. |
| Eastdale Estates ... | 12.91 | 12.11 | 27.34 | 19.33 |
| Gutu (N.C.) ... | 11.88 | 14.74 | 29.64 | 17.05 |
| Glenary ... | 13.78 | 14.10 | 29.78 | 15.11 |
| Gwelo— | | | | |
| Glencraig ... | 13.02 | 10.54 | 29.92 | n.s. |
| Partridge Farm ... | 12.05 | 8.39 | 24.06 | 18.51 |
| Sheep Run Farm ... | 11.98 | 9.06 | 23.83 | 16.15 |
| Inyanga— | | | | |
| St. Trias' Hill ... | 11.61 | 14.50 | 31.79 | 22.63 |
| Insiza— | | | | |
| Roodeheuvel ... | 6.78 | 12.05 | 20.90 | 16.34 |
| Stoneham (Brac Valley) ... | 7.51 | 14.01 | 24.12 | n.s. |
| Makoni— | | | | |
| Bude ... | 9.44 | 10.26 | 24.83 | n.s. |
| Chirumwe ... | 12.51 | 15.11 | 31.32 | n.s. |
| Craigendoran ... | 9.54 | 9.55 | 21.89 | 20.02 |
| Forest Hill ... | 14.39 | 12.37 | 32.91 | 21.40 |
| Gorubi Springs ... | 10.51 | ... | ... | 21.57 |
| Inyagura ... | 11.29 | 14.69 | 30.11 | n.s. |
| Mona ... | 14.06 | 11.73 | 36.07 | 22.05 |
| Monte Cassino ... | 10.92 | 12.87 | 29.30 | 20.51 |
| Ruati ... | 16.95 | 13.85 | 35.54 | n.s. |
| Rusape (N.C.) ... | 7.38 | 13.03 | 25.08 | n.s. |
| Springs ... | 11.54 | 11.85 | 28.49 | 20.90 |
| Tablelands ... | ... | ... | ... | 23.58 |
| Whitgift ... | 13.05 | 13.80 | 30.76 | n.s. |

## RAINFALL—*(Continued)*.

| STATION. | 1928-29. Dec. | 1928-29. Jan. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE E.—(Continued) | | | | |
| Marandellas— | | | | |
| Bonongwe ... | 13.46 | 16.82 | 36.01 | 19.05 |
| Delta ... | 13.68 | 14.96 | 32.32 | 20.35 |
| Elandslaagte ... | 13.48 | 18.12 | 35.17 | 19.86 |
| Lushington ... | 8.98 | 15.50 | 29.07 | n.s. |
| Macheke ... | 11.43 | 17.15 | 32.84 | 20.47 |
| Marandellas (N.C.) ... | 12.86 | 10.26 | 27.87 | 20.94 |
| Marandellas Estate ... | 12.03 | 13.51 | 29.25 | 18.99 |
| Nelson ... | 8.30 | 16.68 | 29.03 | 18.44 |
| Wedza Reserve ... | 13.46 | 22.60 | 40.27 | n.s. |
| Wenimbi ... | 8.94 | 9.35 | 21.89 | n.s. |
| Melsetter— | | | | |
| Brackenbury ... | ... | ... | ... | 32.17 |
| New Year's Gift ... | 10.83 | ... | ... | n.s. |
| Sabi Tanganda Estate ... | 6.75 | 6.65 | 15.79 | n.s. |
| Tom's Hope West ... | 12.90 | 28.25 | 49.87 | n.s. |
| Ndanga— | | | | |
| Bangala Ranch ... | 9.67 | 8.60 | 20.95 | n.s. |
| Doornfontein ... | 9.74 | 9.28 | 23.83 | 15.63 |
| Marah Ranch ... | ... | ... | ... | 18.63 |
| Triangle Ranch ... | 6.05 | ... | ... | 11.19 |
| Zaka ... | 5.61 | 14.25 | 24.56 | n.s. |
| Selukwe— | | | | |
| Aberfoyle Ranch ... | 10.78 | 14.01 | 26.68 | 15.04 |
| Hillingdon ... | 8.20 | 16.48 | 27.16 | 19.08 |
| Impali Source ... | 8.78 | 13.74 | 23.85 | 14.17 |
| Rio ... | 11.94 | 13.13 | 26.64 | 17.50 |
| Safago ... | 10.10 | 10.97 | 24.50 | 19.32 |
| Selukwe ... | 11.34 | 19.73 | 33.13 | 19.28 |
| Umtali— | | | | |
| Argyle ... | 6.58 | 13.70 | 25.19 | 20.75 |
| Embeza ... | 14.31 | 27.91 | 48.95 | n.s. |
| Fairview ... | 12.85 | 16.28 | 33.59 | n.s. |
| Fern Valley ... | ... | ... | ... | 21.37 |
| Jerain ... | 13.79 | 14.32 | 31.33 | 17.75 |
| Mutambara Mission ... | 12.72 | 9.83 | 24.59 | 17.33 |
| Odzani Power Station ... | 16.99 | 13.17 | 35.47 | 22.06 |
| Park Farm ... | 15.37 | 17.90 | 37.74 | 23.07 |
| Premier Estate ... | 14.15 | 14.74 | 33.37 | 19.26 |
| Sarum ... | 11.88 | 15.00 | 30.13 | 18.38 |
| Sheba ... | ... | ... | ... | n.s. |
| Stapleford ... | 16.83 | 34.97 | 59.54 | 35.26 |
| St. Augustine's Mission ... | 14.52 | 15.57 | 36.30 | 21.92 |
| Transsau Estate ... | 10.26 | 10.55 | 23.99 | 19.30 |
| Umtali Gaol ... | 15.00 | 14.90 | 33.90 | 18.01 |
| Victoria— | | | | |
| Brucehame ... | 12.03 | 10.69 | 24.20 | 16.67 |
| Cambria ... | 9.73 | 10.59 | 22.90 | 13.05 |
| Cheveden ... | 10.36 | 7.29 | 19.98 | 17.95 |
| Clipsham ... | 13.19 | 9.79 | 24.65 | 17.19 |

## RAINFALL—*(Continued)*.

| Station. | 1928-29. Dec. | 1928-29. Jan. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| Zone E.—(Continued) | | | | |
| Victoria (continued)— | | | | |
| Gokomere ... | 13.57 | 11.06 | 25.82 | 16.95 |
| Kimberley Ranch ... | 14.15 | 12.72 | 29.20 | n.s. |
| Mashaba ... | 12.70 | 12.47 | 26.88 | 15.36 |
| Miltonia ... | 12.01 | 8.57 | 21.40 | n.s. |
| Riverdene North ... | 9.13 | 12.75 | 24.01 | 15.68 |
| Salemore ... | 8.68 | ... | ... | 18.10 |
| Silver Oaks ... | 12.40 | 10.03 | 23.49 | 18.28 |
| Stanmore ... | 8.20 | 9.58 | 19.15 | 14.24 |
| Victoria ... | 11.57 | 9.57 | 22.81 | 15.78 |
| Zimbabwe ... | 13.43 | 8.39 | 22.73 | 14.89 |
| Zone F.: | | | | |
| Melsetter— | | | | |
| Chikore ... | 16.40 | 10.73 | 28.10 | 23.51 |
| Chipinga ... | 9.09 | 13.48 | 24.28 | 24.35 |
| Lettie Swan ... | 11.55 | 10.97 | 25.22 | n.s. |
| Melsetter ... | 17.83 | 14.61 | 35.86 | 25.49 |
| Mount Selinda ... | 16.11 | ... | ... | 31.66 |
| Vermont ... | 18.34 | 17.11 | 41.16 | 33.48 |
| Umtali— | | | | |
| Chimeze ... | ... | ... | ... | 34.47 |
| Cloudlands ... | 17.54 | 26.38 | 50.55 | n.s. |

## Dates of Meetings of Farmers' Associations, Southern Rhodesia.

| Name of Association. | Place of Meeting. | Secretary. | March. | April. |
|---|---|---|---|---|
| | | | 1929 | 1929 |
| Ayrshire—Sipolilo | Various farms | G. H. Cautherley | 9 | 13 |
| Banket Junction | Banket Hotel | A. M. Hutchinson | 1 | 5 |
| Beatrice District | Farmers' Hall, Beatrice | W. Krienke | 28 | 25 |
| Bindura | Bindura Farmers' Hall | W. E. Fricker | 8 | 12 |
| Bromley | Farmers' Hall, Bromley Siding | W. D. Grier | 6 | 3 |
| Bubi | Queen's Mine | C. H. Olsen | 12 | 9 |
| Bulawayo Landowners' and Farmers' Association | Library Buildings, Bulawayo | W. A. Carnegie | 14 | 11 |
| Chakari | Deweras (Mar.), Cornucopia (April) | L. T. Tracey | 20 | 17 |
| Daisyfield | Somabula (Mar.), Daisyfield (April) | L. E. Edwards | 9 | 20 |
| Darwendale—Trelawney | Various farms | Charles H. Tanner | 27 | 24 |
| Eastern Districts | Farmers' Hall, Chidza | W. E. Richards | 9 | 13 |
| Enkeldoorn | Enkeldoorn | C. N. Ludlowe | 5 | 2 |
| Enterprise | Farmers' Hall | James Watson | 5 | 2 |
| Essexvale | Essexvale | Col. D. Judson | 17 | 21 |
| Felixburg—Gutu | Felixburg (Mar.), Dysart (April) | A. J. Bradshaw | 9 | 13 |
| Figtree Branch, R.L. and F.A. | Figtree Hotel | The Secretary | 5 | 2 |
| Gadzema | Gadzema | M. G. Leahy | 8 | 12 |
| Gatooma | Speck's Hotel | B. L. Henderson | 16 | 20 |
| Gatooma (Golden Valley Branch) | Golden Valley Hotel | C. K. James | 9 | 13 |
| Gazaland (South Melsetter) | Chipinga Hotel | Mrs. C. N. Reading | 4 | 1 |
| Greystone | Quarrie Farm | P. J. van der Walt | 9 | ... |
| Gwanda | Lowenthal's Building, Gwanda | N. J. B. Nilson | 16 | 20 |
| Hartley | Old Schoolroom, Hartley | Mrs. F. C. Watson | 23 | 27 |
| Headlands | Headlands | J. A. Eve | ... | ... |
| Hunter's Road | Hunter's Road | R. W. Twilley | 30 | 27 |
| Insiza South | Farm Lancaster | J. Campbell | 14 | 11 |
| Inyazura | Inyazura | W. P. Frudd | ... | 5 |
| Lalapansi | Lalapansi | B. J. Ingle | 9 | 13 |
| Lomagundi | Sinoia | F. W. Robertson | ... | 12 |
| Lomagundi West | Various farms | A. A. Bisset | 10 | 14 |
| Macheke | Farmers' Hall, Macheke | Major Hastings | ... | ... |

| | | | | |
|---|---|---|---|---|
| Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association | Various Farms | T. R. Colam | 2 | 6 |
| Makwiro | Makwiro | W. L. Parsons | 15 | 19 |
| Marandellas | Marandellas Farmers' Hall | E. Cruikshank | 1 | 5 |
| Marandellas, Southern | Various farms | B. V. Cherry | 6 | 3 |
| Mashonaland | Mashonaland Farmers' Hall, Salisbury | C. Lamb | 8 | 12 |
| Matobo South | Farmers' Hall, Malundi Farm | A. G. Allen | ... | 20 |
| Matopo Branch, R.L. and F.A. | Farmers' Hall, Malundi | W. Mirtle | 16 | 20 |
| Mazoe (Concession) | Concession Hotel | A. W. Laurie | 8 | 12 |
| Mazoe (Glendale) | Farmers' Hall, Glendale | James S. Brown | 13 | 10 |
| Melsetter | Court House, Melsetter | J. C. Kruger | 14 | 11 |
| Midlands Farmers and Stockowners | Royal Hotel, Gwelo | T. R. van Rooyen | 13 | 10 |
| Ngezi-Umniati | Harvieston, Enkeldoorn | Miss Harvie | 30 | 27 |
| North Umniati | ——— | J. F. Eagar | Not | received |
| Norton and Lydiate District | Norton | R. D. Palmer | 1 | 5 |
| Nyamandhlovu | Nyamandhlovu | R. D. McLean | ... | ... |
| Odzi District Farmers | Odzi Hotel | F. H. Burnett | 2 | 6 |
| Poorte Valley | Various places | A. D. Wilson | 16 | 20 |
| Que Que | Offices of the Que Que Sanitary Board | A. A. Ackerman | 16 | 20 |
| Rusape Farmers' Association | Rusape | R. Munch | 2 | 6 |
| Salisbury South | Various farms | P. Linton | 27 | 24 |
| Selukwe | The Hotel, Selukwe | W. T. Simpson | ... | ... |
| Shamva | Shamva Court House | W. Stanley-Stollard | 15 | 19 |
| Two Rivers Farming Association | Various farms | W. L. Parsons | 16 | 20 |
| Umboe (Branch of Lomagundi F.A.) | Fupi (Mar.), Elmley (April) | C. W. S. Ford | 9 | 13 |
| Umvukwe Farmers' and Tobacco Growers' Association | Various ranches | Com. E. Wrightson | 9 | 13 |
| Umtali | Drill Hall, Umtali | A. Howat | 7 | 4 |
| Umvuma and District | Umvuma | S. T. Montgomery | Not | received |
| Victoria | Victoria | G. E. Lamb | 2 | 6 |
| Wankie District | ——— | F. H. Going | Not | received |
| West Umvukwe Farmers' Association | Various farms | G. H. Gordon | 2 | 6 |
| Western | Plumtree Hotel | The Secretary | 9 | 13 |
| Willoughbys | Willoughbys | A. E. Roberts | Not | received |

# Export of Cattle from Southern Rhodesia, 1929.

| Month | Union | | England. | Congo | | N. Rhodesia | Portuguese East Africa. | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Slaughter | | Slaughter | | | | | | | |
| | Johannesburg | I.C.S. for overseas | On hoof | Slaughter | Breeding | Breeding | Slaughter | Trek | Breeding | |
| January ... | 66 | ... | ... | 2,222 | 272 | 12 | ... | ... | ... | 2,572 |
| February ... | | | | | | | | | | |
| March ... | | | | | | | | | | |
| April ... | | | | | | | | | | |
| May ... | | | | | | | | | | |
| June ... | | | | | | | | | | |
| July ... | | | | | | | | | | |
| August ... | | | | | | | | | | |
| September ... | | | | | | | | | | |
| October ... | | | | | | | | | | |
| November ... | | | | | | | | | | |
| December ... | | | | | | | | | | |

J. M. SINCLAIR,
Chief Veterinary Surgeon.

# Rhodesian Milk Records.

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| De Grendel Rita | Friesland | 7,622.00 | ... | 270 | W. R. Blackwell, Norton |
| Astralia | do | 1,547.00 | ... | 60 | do do |
| Ogden Hall Alberta | do | 2,288.00 | ... | 60 | do do |
| Dunoran Pearl | do | 1,456.00 | ... | 30 | do do |
| Rathwick Princess IV. | do | 6,221.00 | ... | 300 | R. G. Fox, Umtali. |
| Rathwick Maud III. | do | 8,440.00 | ... | 300 | do do |
| Rathwick Mermaid | do | 9,249.50 | ... | 300 | do do |
| Home Park Elske V. | do | 9,422.75 | ... | 330 | do do |
| Home Park Alma V. | do | 9,657.00 | ... | 330 | do do |
| Home Park Agnes | do | 8,437.00 | ... | 270 | do do |
| Umtali Nereid | do | 6,426.25 | ... | 300 | do do |
| Umtali Queen | do | 6,406.75 | ... | 270 | do do |
| Umtali Mary ... | do | 5,562.00 | ... | 270 | do do |
| Erin-go-bragh | do | 5,024.50 | ... | 210 | W. Mitchell, Iron Mine Hill. |
| Freesia ... | Grade Friesland | 4,459.50 | ... | 210 | C. E. Strickland, Shamva. |
| Kate ... | Grade Shorthorn | 4,925.75 | ... | 270 | do do |
| Geranium ... | do | 3,105.75 | ... | 150 | do do |
| Canie Bacan ... | Friesland | 1,715.25 | ... | 60 | Mrs. J. Strickland, Umtali. |
| Quodzi Maggie | do | 955.75 | ... | 30 | do do |
| No. 39 ... | do | 999.00 | ... | 30 | do do |
| Canie Janet ... | do | 1,103.00 | ... | 30 | do do |
| Harlen's Atje ... | do | 825.25 | ... | 30 | do do |
| Groenvlei Bedford Alberta | do | 9,316.00 | ... | 270 | P. T. Webb, Iron Mine Hill. |
| Sheep Run Duchess | do | 959.50 | ... | 30 | do do |
| Gertie ... | do | 730.50 | ... | 30 | do do |
| De Grendel de Hoop | do | 12,374.00 | 410.53 | 355 | Government Farm, Gwebi |
| De Grendel Froukje | do | 12,515.50 | 345.68 | 325 | do do |
| De Grendel Selma | do | 11,844.25 | 359.23 | 301 | do do |
| De Grendel Bessie Burger | do | 5,106.75 | 164.78 | 109 | do do |
| De Grendel Stienser | do | 2,111.00 | 59.24 | 42 | do do |

## RHODESIAN MILK RECORDS (continued).

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| Wit Fancy ... | Friesland | 9,492.50 | 297.16 | 387 | Government Farm, Gwebi |
| Mimosa Pel Stienser | do | 8,300.75 | 293.41 | 349 | do do |
| Mimosa Pel Clara II. | do | 10,916.25 | 334.79 | 308 | do do |
| Mimosa Clara X. | do | 12,754.50 | 374.16 | 210 | do do |
| Melrose Corrie... | do | 9,985.25 | 367.59 | 248 | do do |
| Melrose Roosje | do | 6,944.25 | 192.08 | 184 | do do |
| Melrose Maandag | do | 5,247.75 | 186.00 | 133 | do do |
| Melrose Hetta | do | 312.00 | 9.76 | 5 | do do |
| Madge of Batavia | do | 2,155 00 | 84.58 | 84 | do do |
| Gwebi Laura ... | do | 4,411.50 | 158.19 | 154 | do do |
| Allie ... | do | 6,172.75 | 182.52 | 133 | do do |
| Flora of Elsmore | do | 1,710.50 | 45.32 | 33 | do do |
| Roodebloem ... | Grade Friesland | 3,861.25 | 110.81 | 140 | do do |
| Waterbloem ... | do | 6,673.25 | 186.50 | 130 | do do |
| Kleinbloem ... | do | 8,259.50 | 263.46 | 306 | do do |
| Clara ... | do | 2,695.00 | 100.50 | 50 | do do |
| Gwebi Gay ... | do | 1,671 00 | 62.65 | 52 | do do |
| Gwebi Elsie ... | do | 7,757.25 | 247.61 | 165 | do do |
| Gladys ... | do | 9,015.50 | 272.20 | 203 | do do |
| Isa ... | do | 5,253.50 | 173.98 | 99 | do do |
| Janie ... | do | 1,953.50 | 68.51 | 49 | do do |
| Fanny ... | do | 165.50 | 5.70 | 3 | do do |

# Farming Calendar.

## March.

### BEE-KEEPING.

As the latter end of this month should herald the approach of the second and last real honey flow of the season, see that enough extra supers are ready for placing on hives as required, watching also that the fully drawn out combs of shallow frames that are on hand to fill them with are kept free from the wax moth; further, examine all supers that are already on the hives for this serious defect, though strong colonies will as a rule keep the combs free from this pest. March being usually a hot month, look well to the entrance; enlarge when and where necessary, and have ventilating lids on the tops of each hive. Extra ventilation can be provided for when required by placing small metal or wooden wedges underneath the top super, but not to be open enough to let out or in a single bee. Where quilts are noticed to have been eaten or more or less destroyed during the summer months, now is the time to make fresh ones so as to be ready for the closing down and the making snug of each hive when winter approaches; old flour bags or old deck chair canvas make capital quilts. Bees during this month will consume a quantity of water; see that some is always kept in the apiary in floating cork chips. This will save much labour and flight for them, as well as prolong their period of work and usefulness. As stated in last month's notes, flying swarms may be expected now any day, so prepare for their capture if required by having all details and items ready for immediate use.

### CITRUS FRUITS.

Two thorough sprayings about this season, when the rains are usually practically over, at an interval of about two weeks, will often obviate the necessity for further work against scale insects until the beginning of the next wet season. If not already done, orchards should be ploughed and cross-ploughed and worked up into a really good surface, so that the cultivators can be kept going, say, every two weeks until it is necessary to irrigate, after which cultivation should be continued. If March prove a dry month, orange trees holding up a crop of fruit will probably require irrigation, but under normal weather conditions it should not be necessary. The same remarks apply as last month with regard to fruit moths. About the end of this month fall budding can be taken in hand, that is the insertion of buds that are intended to remain dormant until spring. This applies to higher altitudes, but in low country, where the growing season is extended, dormant budding should not be done until latter end of April.

### CROPS.

Watch oats for rust, and, if badly infested, cut crop for hay as soon as weather permits. Ridge late potatoes, and if weather is dry prevent ridges from cracking, to check tuber moth infestation. Finish ploughing under all green manure crops while the ground is still moist enough to promote rapid decomposition. Late in the month begin to cut silage crops

and ensile. Cut out barren maize plants and feed to stock or ensile. Cut Sudan grass for hay to permit of final late growth for autumn grazing. Reap any crops that are ready, and plough the stubbles **at once.** Lift ground nuts that are sufficiently matured. Watch for ground nuts making second growth; reap, and when sufficiently dry, place in cocks with nuts inwards and cover the top securely. Sow onion seed beds for winter crop. Watch the weather for hay-making and take advantage of fine spells. Towards the end of the month hay-making should normally be in full swing. Continue to plough all lands in succession immediately the crops are reaped from them. Vleis and irrigable lands should now be ready, or in process of being prepared, for winter crops. Early sowings of Algerian oats, barley or rye for green forage can be made. Allow any potatoes lifted to dry before storing them, but do not leave too long in the sun. Destroy witch weed and other noxious weeds. Continue to make all the kraal manure possible by throwing grass and litter into kraals, yards, etc. Begin to select in the field maize plants for seed purposes, and mark them with slips of coloured cloth. Press on with the breaking up of any virgin land which may have been stumped or cleared earlier in the year. Place orders for grain bags without delay. Early in the month silage pits should be cleaned out or, where necessary, new pits dug.

## DAIRYING.

This is usually the most favourable month of the year for dairy operations. Cooler nights are now in evidence, and there is usually little difficulty in maintaining a low temperature in the dairy and cheese-room. If elementary precautions are taken, all cream should be first grade, and first-class cheese should be made, as a gassy condition of the milk is rare. Dairy cows, unless they are very high producers, can go without extra rations, because the grass is now in seed and grazing is ample. The cheese storeroom is generally full of cheese, and care should be taken to turn the cheese regularly. The windows and doors should be opened at night and closed in the daytime. A little mould on the cheese will not affect its quality, but if the mould is excessive the cheese should be rubbed daily.

Calves which are under four months old should be kept in and allowed to nibble at well-got hay; at the same time a little dry mealie meal and monkey nut cake will do them good and teach them. to eat concentrates. An ample supply of clean water should be provided in the calf run.

## ENTOMOLOGICAL.

Maize.—The stalk borers of the second brood may now be found in the stalks, but nothing can be done at this stage. Caterpillars sometimes attack the crop as a sequel to cultivation after grass weeds have made too much growth. The caterpillars attack the crop on account of their more natural food being suddenly destroyed. Prevention and not cure is indicated.

Tobacco.—The crop will by this time mostly have outgrown insect injury, but leaf miners and budworms may be in evidence. The latter are usually destroyed by hand when topping. Any plants affected with stem borer should be removed and destroyed.

Potato.—If ladybird beetles or caterpillars are injurious, spray with arsenate of lead (powder) 1 lb. to 30 gallons of water. Careful hilling should be attended to with the object of preventing and checking tuber moth attack.

Vegetable Garden.—If sawfly attacks plants of the cabbage family dust with Paris green 1 lb., fine sifted slaked lime 20 lbs. Against cabbage louse (aphis) wash plants frequently with a strong spray of water. Destroy blister beetles by hand. Plants of the melon family may be baited regularly with arsenate of lead (powder) 1½ ozs., treacle ½ gallon (or cheapest sugar 2½ lbs.), water 4 gallons, to keep down fruit flies. For

leaf-eating caterpillars and beetles, etc., spray with arsenate of lead (powder) 1 lb. in 30 gallons of water on foliage which will retain water. Cabbages are best dusted.

Citrus Trees.—Collect and destroy infested fruit to keep down citrus codling. Fruit-piercing moths sometimes attack the fruit during the month, especially navels. They work at night and can only be dealt with at present by hand destruction. The trees should be watched for development of aphis and soft brown scale on the young growth and prompt measures taken. Resin wash at two-thirds standard strength is suitable.

Mosquitoes, House Flies, etc., may be very prevalent during March. Destroy breeding places. Poison or trap adult flies. Attend to screening of residence.

## FLOWER GARDEN.

Flower seedlings for winter blooming should now be coming on, and should be planted out during showery or cloudy weather. Cuttings of carnations may now be made, and should be taken from selected plants which have borne the choicest blooms. The cuttings should be dibbled in half paraffin tins containing three parts sand to one of loam, and kept in a moist condition in a shady position sheltered from the winds. Make main sowing of winter-flowering sweet peas in a well-prepared and rich soil.

## VEGETABLE GARDEN.

The sowing calendar is the same as that recommended for last month. Plant out from seed beds cabbage and cauliflower; care should be taken during this month, as the end of the rainy season approaches, to dig with a fork all the ground in the garden. The heavy rains settle this down hard, and as soon as the dry weather begins the soil cracks and lets out all the sub-soil moisture by evaporation. As soon as the rains cease entirely it is advisable to go over the ground and fine down with a rake, leaving some three or four inches of quite fine soil to act as an earth mulch.

## FORESTRY.

Cultivation where necessary should be undertaken between the rows of trees planted out in previous months. If cultivation is carried out with the hoe, care should be taken not to pile earth round the base of the stems. New ground for next season's planting should be roughly broken up with the plough. Bulk plantings may be proceeded with during the month.

## GENERAL.

At this time the condition of stock on the veld is usually good. It is well, however, to look ahead and make ready for the coming winter by the provision of winter feed in such forms as veld hay, silage, baled fodder from maize, manna, oats, teff, velvet beans, and the like, and by taking steps to ensure that water will be available for the stock in winter as near their grazing ground as may be.

## POULTRY.

The breeding pens should have all been mated up by now, as the first chicks should be out by the beginning of April. Much more care should be used than is usually the case when selecting birds for breeding. Only the very best, i.e., the strong, healthy, vigorous ones from the best layers, should be chosen. A pamphlet on "Selection and Mating for Improvement" can be obtained on application to the Editor or the Poultry Experts. This deals fully with the subject. Always keep an eye on the male bird; many are apt to get thin and run down in health, due to their allowing their mates to eat all the food. Such birds are better breeders than those that chase their mates away from the food. Every male that is being

bred from should be given a good meal by himself each day, to ensure health and vigour. The incubator should be thoroughly overhauled, cleaned and disinfected before the eggs are put in.

### STOCK.

Cattle.—The precautions recommended for February apply equally to March. Arrangements should be completed for storing as much silage as it is proposed to make, so that the crops reserved for this purpose may be harvested immediately they are ready.

Sheep.—The same precautions as for February should be taken, but as less rain may be expected, conditions will probably be more favourable. If late winter lambs are not desired, the rams should be removed from the flock.

### TOBACCO.

All late plants should be topped low to hasten maturity. The bales of cured leaf should be examined to ascertain whether or not the tobacco has been baled in proper condition. Seed heads should receive continued care. Land ploughed during February should be disced and rolled to assist the decomposition of organic matter. Tobacco fields already cleared of plants should be immediately ploughed. Tobacco bulks should be examined and turned, if necessary.

### WEATHER.

Rains may be looked for in considerable quantity, though less than in previous months, 5 inches in Mashonaland and 3 inches in Matabeleland being normal, with as usual more on the eastern frontier. No useful rain need be reckoned upon after the end of this month, except on the eastern border, but the rainy season tapers off in an irregular and often erratic manner and without certainty.

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# April.

### BEE-KEEPING.

Where numbers of the bee-louse are seen attaching themselves to the legs of bees and also among the quilts which cover the frames, this pest can be controlled by crushing them with the finger. In the cooler districts, crates that are partially filled with honey should be removed, and into the lift which they occupied plenty of warm clothing should be snugly packed.

### CITRUS FRUITS.

During the first half of this month, autumn budding can still be performed if the sap is still up and the bark of the stock slips freely. Unprofitable and off type trees that have been headed back for top working and which have been carefully thinned out may have the shoots on which February-March buds have failed re-budded to profitable varieties. If the March rains have been sufficient and ploughing and cultivation have been completed, continue cultivation to retain soil moisture and destroy winter weeds. If a dry March has been experienced and cultivation has been badly performed, irrigation should be commenced or continued to keep the trees and fruit in good order. If not already applied to the unthrifty trees which are late with their autumn flush, soluble fertilisers containing nitrogen and phosphoric oxide can be applied with advantage to these trees. The fertiliser should be worked into the soil with a cultivator and followed up with an irrigation. Exporters should have everything in

readiness for packing the early fruit, which should be fit to market about the end of the month. Scale infested fruit will be unfit for export unless treated at once. See entomological notes for treatment.

## CROPS.

If sufficiently mature, begin cutting and stooking early maize over a small acreage and plough up the ground whilst still damp between the rows of stooks. If ripe, reap and husk early planted maize, and keep in a separate dump. Continue to make field selections of the best maize plants, and mark those required for seed with strips of coloured cloth. Lift any ground nuts and potatoes showing signs of making second growth. Make silage; cut maize for this when the ears are in the "dough" stage. Pick up and stook maize plants blown over to protect the ears from white ants. Feed sweet potato vines to stock, reserving any new growth of vines for feeding as grazing in May. Plough in any green manure crops not already turned under. Plough fallowed land. Keep potatoes reserved for seed on racks in a cool place protected from frost, but well ventilated. Transplant onions from seed-beds to irrigated or naturally moist lands; irrigate about once a week, but do not apply too much water. Pick over potatoes which may be lifted, and remove the bad and diseased ones. Winter cereal crops for grain can be sown towards the end of the month. Cart manure to the lands. Remember that good and deep ploughing to a depth of at least 7 to 8 inches is essential, and the basis of all successful arable farming. If the lands are not already ploughed so deep, increase the depth of ploughing about an inch a year until this depth, or even more, is reached. On lands which have been ploughed for a number of years at the same depth, use a grubber to stir up the sub-soil without lifting it to the surface. Too much attention cannot be paid to good tillage. It is usually good practice to follow the plough at once with a harrow or other suitable implement to break down the clods before they bake hard. Continue breaking up new lands; the earlier this is done the more complete is the decomposition of the vegetable matter in the soil. When making hay of coarse legumes such as velvet and dolichos beans and cowpeas, be sure that the vines are dry before stacking. Handle the hay as little as possible to avoid loss of leaf. Thought should be given to laying in supplies of thatching grass for thatching and repairing roofs. The veld may be beginning to dry off. Consideration may be given to mowing or otherwise preparing fire lines as a preventive against veld fires.

## DAIRYING.

At this season of the year the milking kraal is generally far from clean owing to the excessive amount of mud or dust which has accumulated during the latter part of the rainy season, and in consequence farmers invariably have trouble in producng first-grade cream. Every endeavour should be made to erect a small milking shed in which four or five cows or more can be milked at a time, and every effort should be made to keep the cows clean. The udders should be wiped before milking with a clean, damp cloth, and the farmer should see that the natives' hands are washed with soap and clean water before and after each milking.

If butter is made, the cream and washing water should be put out overnight, and if the cream is churned early the following morning, very little difficulty should be experienced in obtaining a good grain and a firm body in the butter.

From this time of the year onwards, cheese making operations are usually most successful. The evening's milk should not be kept in the dairy, but should be placed outside, preferably in a bath, and covered over with butter muslin, cheese cloth or mosquito gauze netting. Care should always be exercised, however, in using evening's milk. Morning's milk plus a starter usually gives the best quality, and if a starter is used, care should be taken that it shows no signs of gasiness or off flavours.

The season of abundant green pasture is over, and the natural grazing, unless supplemented by some green food or succulent roughage, is not sufficient to maintain a full flow of milk. The most economical supplement to veld grazing at this time is maize silage, and this should be fed in liberal quantities to all milking cows and growing stock. A few pounds of concentrates in addition would also be of great benefit to the milking cows, which should not be compelled to subsist entirely on veld hay and silage.

## DECIDUOUS FRUITS.

If not already done, orchards should be ploughed, harrowed and well cultivated to retain the soil moisture for spring blossoming and growth. Varieties such as the Chinese peaches, etc., may be pruned after the leaves have dropped.

Order all trees for winter planting during June-July. August planting is unsafe for many early growing varieties of fruits.

All late apples should be harvested and stored or marketed.

## ENTOMOLOGICAL.

Maize.—Although certain pests, such as earworm and stalk borer, may be in evidence, there are practically no operations against insect pests that can be carried out economically during this month.

Tobacco.—Any remaining plants showing stem borer attack should be removed and burnt. Watch should be kept for emergence of the adult wire worm beetle. These should be poisoned with Paris green in the proportion of 1 lb. to 200 lbs. of maize meal. The bait should be spread on the land in small heaps early in the morning and shaded from the sun.

Cotton.—Damage to bolls from bollworms may be betrayed by the dropping of the bolls attacked. These should be collected and burnt. Cotton stainers should be destroyed by hand collecting. Guinea fowl, turkeys, etc., may be encouraged about the land to destroy stainers and other insects.

Citrus.—Collect and destroy infested fruit to keep down citrus codling moth. Red scale should be destroyed by fumigation with hydrocyanic acid gas. Soft brown scale may be controlled by spraying with resin wash. If unseasonable young growth appears, aphis may develop and must be kept suppressed to prevent soiling of the fruit with black fungus.

Vegetable Garden.—Plants of the cabbage family are liable to suffer severely from cabbage louse and Bagrada bug. The former can be kept largely suppressed by frequent washings with a strong spray of cold water. Bagrada bug is difficult to fight, but carbolic emulsion and resin wash have been recommended as sprays elsewhere. These washes must be applied directly to the insects, and the immature stages are more readily killed than the adults.

Potatoes should be cultivated systematically and hilled to keep the tuber moth from the tubers.

## FLOWER GARDEN.

The garden can generally be depended upon to make a good show in the autumn and early winter, provided that the plants have been previously kept in a healthy condition by watering, mulching and feeding. Snap dragons and other seedlings, also cuttings, may now be planted out into their permanent positions. Sowing may be made of hardy annuals, such as hollyhocks, larkspur, clarkia, pansy, petunia, sweet peas, gaillardia and candytuft. Bulbs of spring flowering plants may be taken up, divided and replanted.

## VEGETABLE GARDEN.

Sow at once all that is required to fill up the vegetable garden before the soil has parted with all moisture. Seeds sown now will germinate freely, and plants will establish themselves more quickly than during the colder weather, which can soon be expected. A start should now be made at cleaning asparagus beds. This is a most popular vegetable,

and yet one rarely sees it cultivated in the ordinary Rhodesian garden. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed vegetables in the whole garden. Depth of good soil and plenty of manure are all that this plant requires. Rhubarb roots may be taken up, divided and replanted this month. Plant out from seed beds cabbage and onion plants into their permanent quarters. Sow a full crop of peas, broad beans, turnips, onions, lettuce and radish.

## FORESTRY.

Cultivate the soil in the young plantations either by means of machines or hand labour. The cultivation will conserve moisture. Hoed out weed growth should be applied as a mulch round the base of each young tree. Be careful not to pile earth round the stems of the young trees. Covering the stems with earth even for an inch or two interferes with sap circulation and invites attacks by termites.

Prune the young trees to single stems. Any strong undesirable branch growth may be checked by breaking off the leading shoot.

## POULTRY.

The first chicks should now be out, and these, having been hatched, must be well looked after. No food should be given for the first 36 to 48 hours. Leave them to sleep as much as possible. See that they have plenty of fresh warm air, but are not exposed to draughts. After 48 hours give some small grit and charcoal to purify the intestinal tract and aid digestion. A pamphlet dealing very fully with incubation and rearing of chickens can be obtained gratis on application to the Poultry Experts, Department of Agriculture.

One comes across many cases of wrong treatment of chickens in this country, the chief being uncleanliness, over-crowding, giving food too early and dirty drinking water. Two most important foods are animal protein, especially in the form of thick separated or whole milk and green food, especially onions or eschalots or their green tops. The loss in the rearing of chicks is very great; this should not be so if good breeding stock is used, the eggs from these are carefully handled and incubated and the chicks reared with care and common sense.

Any turkey chicks hatched at this time of the year should be well looked after. They should be kept warm, dry, free from insects, fed on dry food only, given plenty of thick separated milk, onions or onion tops, dry mash and grain. A pamphlet on turkeys and turkey rearing is obtainable gratis from the Poultry Experts.

Ducks should do well during the month, the weather being as a rule cool, moist and bracing; but the houses in which they sleep must not be damp. Duck breeders should always be on the "qui vive" for a round worm called "Trichosoma contortum," which is often fatal to ducks. It is found in the œsophagus, and causes arrest of growth, emaciation and weakness and sometimes epileptiform attacks. A swelling will be noticed at the lower part of the neck, which rapidly increases in size, and death occurs in one to three days. Onions, or preferably garlic, mixed with the food is a good preventive and cure. Another good remedy is essence of turpentine mixed with twice its quantity of olive oil and one or two tablespoonfuls given for a dose.

## TOBACCO.

The grading of the brighter grades should be proceeded with as soon as convenient. All leaf which has cured green should be bulked separately and be regularly examined to avoid serious damage through overheating. Tobacco seed heads, when mature, should be removed from the plants and stored where no damage will occur through activities by rats and mice. Care should be taken to store these seed heads with the pods uppermost, as otherwise much seed may be lost. Clear and plough the land soon after the crop has been harvested. Burn old stalks as a control measure against possible carry over of disease.

# Notes from the "Gazette."

| "*Gazette*" *Date.* | *Items.* |
|---|---|
| | AFRICAN COAST FEVER. |
| 25.1.29. | Government Notice No. 841 of 1928 declaring an area of infection in the native district of Charter is cancelled. (G.N. No. 41.) |
| | CATTLE DIP. |
| 25.1.29. | Improved Arsenoda cattle dip has been registered in terms of Government Notice No. 528 of 1927. |
| | GAME LAWS. |
| 1.2.29 | Klipspringer are protected in the Wankie Game Reserve and must not be hunted or destroyed for a period of five years from 24th February, 1928. (G.N. No. 69.) |

# Government Farm, Matopos.

## FOR SALE:

Pedigree Large White Pigs, Gilts. Prices on enquiry. —Apply to Manager, Government Farm, Matopos, Private Bag, Bulawayo.

# Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

## AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 456. Legumes in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 539. Barley Growing.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 546. Notes on Fertilisers and Soil Treatment, by T. J. Mossop.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 616. The Ground Nut or Monkey Nut, by C. Mainwaring.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.

No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
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Southern Rhodesia's stand at the Birmingham and Midland Grocers, Bakers, Confectioners and Caterers' Exhibition, 15th to 24th January, 1929.

THE RHODESIA

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# Editorial.

*Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:— The Editor, Department of Agriculture, Salisbury.*

**Advertising Rhodesia.**—As will be seen from the illustration on the opposite page, the Colony was represented at Birmingham on the occasion of the Grocers' Exhibition held in January last. The exhibition was opened by Sir George Warburton Fuller, K.C.M.G., Agent General for New South Wales in London, in the presence of the Lord Mayor of Birmingham and a large concourse of people. During the period of the exhibition, which lasted from 15th to 24th January, some 102,000 persons passed through the turnstiles. At the Rhodesian stand a special display was made of 126 pounds weight of Rhodesian tobacco of various types, and exhibits of agricultural products included maize, cotton, ground nuts, beans, peas, sunflowers, wheat and barley, as well as various grasses. The mineral specimens included

gold quartz, chrome ore, asbestos, mica and other base metals. The stand allotted to Southern Rhodesia was situated in a very good position and the exhibits were conspicuously displayed. Mr. Bouchier, of the High Commissioner's office in London, was in charge. Altogether it is considered that the possibilities of the Colony were well presented to the people of the Midlands, and it is thought that the special effort made to popularise Rhodesian tobacco in this populous part of England will bring good results.

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**Laboratory Diagnosis of Animal Diseases.**—We are requested by the Director of Veterinary Research to draw special attention to a note appearing in this issue by Mr. D. A. Lawrence, B.V.Sc., dealing with some of the common errors committed in preparing and forwarding blood smears and other specimens for the laboratory diagnosis of animal diseases. In this country the importance of accurate and early diagnosis is so great that not only is it the moral obligation of every stockman to submit smears from all sick and dead animals, but to learn to prepare them in a proper manner and so assist the laboratory worker who examines them. It should not be necessary to point out that his labours and responsibilities are greatly increased by any ignorance and carelessness in the preparation of the specimen submitted to him for diagnosis. Stockowners are therefore urged to study this short article and to co-operate by performing their part of the work as skilfully and carefully as possible.

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**Tractor Ploughing Costs.**—In the issue of this Journal for May, 1928, we asked any of our readers who use tractors to furnish us with detailed information of their tractor ploughing costs. At the time we pointed out that costs based on operations in other countries are of limited value, due to the variation in costs of fuel, lubrication, spares, supervision and types of land in which the cultural operations are carried out. First hand information of operations in this Colony was therefore solicited. A reader now writes reminding us that it is twelve months since the request was made and that

he is disappointed to find nothing has yet been forthcoming. He states: "As there must be many like myself, 'sitting on the fence,' to whom these details would be the deciding factor, would not some of our tractor pioneers do us this favour, together with the publication of some of their experiences? It would at least be very gratefully received by . . ."

There are to-day quite a number of farm tractors operating in this Colony, and we would again ask some of the owners to be so good as to furnish us with the information asked for, which we shall be pleased to publish in the earliest available issue of this Journal.

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**Tobacco Culture in Southern Rhodesia.**—We draw the attention of tobacco growers to two important and timely articles which appear elsewhere in this issue of the Journal on the subjects (1) of curing Virginia leaf, and (2) Blackfire of tobacco. In the former article the Chief Tobacco Expert deals with some of the more common difficulties encountered in such a season as the present and details the remedial measures which should be taken. He shows that, apart from the necessary adjustment of temperatures in the barn to cure the leaf to the best advantage, there are a number of "pre-curing" factors which have to be taken into consideration, such as soil selection, fertilising, field management and seasonal conditions, and it would be well for growers to bear in mind what is written when the time comes for planting and dealing with next season's crop. We now have in this Colony a number of experienced and capable growers who could no doubt, if they chose, impart much valuable information on the problems associated with tobacco growing in this Colony. After all, our knowledge of the crop in comparison with countries such as America is very limited, and we have a good deal to learn as to the best methods to be employed. A pooling of ideas must be for the common good, and we shall be only too pleased to publish any information which may be useful to others. Whatever is written will be submitted to the Chief Tobacco Expert for an expression of his views, and it may be that a point will be elucidated which has not been dealt with in the numerous

articles which have already appeared in this Journal. We trust that growers will respond.

The article on blackfire raises a very important point, viz., as to whether the markings on the leaf so prevalent at this time of the year are what they are assumed to be—angular spot. The Mycologist suggests that the "spotting" may be due to excessive dressings of nitrogenous fertilisers applied late in the season. The suggestions he makes should receive the careful consideration of growers.

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**Crop Returns for Season 1927-28.**—The Government Statistician has issued a preliminary statement showing that the maize harvest for the season 1927-28 totalled 1,277,136 bags, an average yield of 4.3 bags per acre. This is the lowest acre yield during the last ten years with the exception of the season 1921-22, and is nearly two bags per acre less than that recorded for the previous year. The district of Mazoe, which is the main maize producing area in the Colony, only obtained a yield of 5.5 bags per acre, a reduction of 3.4 bags per acre as compared with the season 1926-27. The total acreage under maize was 295,290 acres, an increase of 27,936 acres. Maize grown for silage increased by 2,726 acres.

The rainfall during the season under review was considerably below normal. Rains were good during the early part of the season, and everything pointed to an excellent harvest, but the almost complete cessation of rain from the latter part of January seriously affected all crops, and the late rains in March were of no assistance to the maize crop, and on the whole adversely affected tobacco.

There was a large increase in the land planted to tobacco, which amounted to 47,722 acres, as compared with 30,164 acres in the previous season. The total crop harvested was 24,889,244 lbs., an average of 521 lbs. per acre. While the yield was over 100 lbs. per acre less than that obtained for the season 1926-27, it was, despite the greatly increased acreage and an unfavourable season, 80 lbs. per acre better than the average for the last ten years.

The acreage under ground nuts decreased by 1,000 acres, and the yield was one bag per acre less than that in the

previous season. Despite the high yields recorded by individual growers, the average yield for the Colony from this crop is disappointingly low.

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**"Diseases of Animals in Tropical Countries."**—We frequently receive enquiries from readers asking for information in bulletin form on diseases of animals. Reference to the list of bulletins printed at the end of the Journal under the heading of "Veterinary" will show that the number of such bulletins is very limited, and necessarily so, for it is obviously impossible to include under this head the many diseases which animals are subject to in this Colony. Further, the services of the Government Veterinary Surgeons are available to those who seek advice. However, it is realised that there is a need for a work of reference which will assist the stock owner in diagnosing a malady, and enable him in certain cases to apply the necessary treatment. Such a need is met by "Diseases of Animals in Tropical Countries," the authors of which are C. R. Edmonds, M.R.C.V.S., late Assistant Chief Veterinary Surgeon, Southern Rhodesia, and G. K. Walker, C.I.E., O.B.E., F.R.C.V.S., late of the Indian Veterinary Service.

It will be remembered that a work by Edmonds, bearing the title "Diseases of Animals in South Africa," was published in 1921, and had a ready sale in South Africa and this Colony. The present work is a revision of the previous book, and its scope has now been extended to include diseases occurring in other countries as well as South Africa and Southern Rhodesia. Much of the original matter remains, as being generally applicable in all tropical and sub-tropical countries, but it has been rearranged and some has been entirely rewritten so as to incorporate recent knowledge and to include a description of diseases found in all parts of the world.

The book has 407 pages, is well printed and illustrated, and should be in the possession of every stock owner in this Colony. The publishers are Messrs. Bailliere, Tindall and Cox, 7 and 8, Henrietta Street, Covent Garden, London, and the price is 25s. net.

**Cotton.**—We have received from the Empire Cotton Growing Corporation a bulky volume in which is included the reports for 1927-28 of the various experiment stations which have been established under the ægis of the Corporation in various parts of the Empire. The far-flung activities of the Corporation will be realised from the locale of the stations, which are situated in Queensland, the Union of South Africa, Swaziland, Southern Rhodesia, Anglo-Egyptian Sudan, Uganda, Nyasaland, Nigeria, Fiji and Trinidad. At each of these stations investigational work of a highly important nature is being carried out with the object of rendering Great Britain less dependent upon foreign sources for her supplies of raw cotton. Each Dominion and Colony has its own peculiar difficulties to overcome, and time must necessarily elapse before definite results can accrue. The reports show, however, that material progress is being made and that the vast resources of the Empire are in the process of being turned to account.

The report on Southern Rhodesia is a very comprehensive record of the work undertaken, graphs and illustrations being used to explain certain points. It is too lengthy to make other than a brief reference here to what is written, and suffice it to say that the feature of last season's work was the success achieved with U4, a variety obtained from the Corporation's Plant Breeding Station at Barberton. One of the chief enemies of cotton in this Colony appears to be the jassid, and until a variety is produced which will resist the attacks of this insect, cotton growing will be considerably restricted. In U4 a variety possessing the required powers of resistance seems to have been found, while it also promises to be a fair yielder of good quality cotton. It is true that U4 has only been subjected to a year's trial at Gatooma, but the results obtained were sufficiently encouraging to justify small issues of seed to farmers in different parts of the Colony for seed propagation this season. The variety will thus be tested out under practical farm conditions and in a season totally different to that experienced at Gatooma last year, which was very dry. If the variety stands up to these conditions, U4 should help to meet our requirements, and we shall indeed be indebted to the Empire Cotton Growing Corporation, which has rendered this possible. In the meanwhile work at Gatooma is proceeding. A large number of re-selections are

undergoing further trial, and it is hoped that the best of these will become available for distribution throughout the Colony each year.

It is too early yet to make any definite statement about the conditions of the cotton plots in the districts beyond mentioning that the majority are up to expectation. For the final result we shall have to exercise patience for another two months.

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**The Researcher and the Producer.**—The following extract from the annual report of the Public Service Commissioner of Queensland raises a question of the greatest importance to all agricultural communities. Scientific research must obviously fail in its object unless the results obtained are translated into practical action. The position is put with great clarity in this extract, which appeared in the "Queensland Agricultural Journal."

"The new slogan 'Research, Research' seems to be drowning the old slogan 'Produce, Produce.' The voice of the scientist rings through the land announcing discoveries which scientific research has made, and some of these discoveries approach the magical; compared with them, even wireless becomes almost a thing of yesterday. Listening to the fascinating accounts of these discoveries, one becomes a little uneasy as to whether science is not racing ahead of the producer and far out-distancing him; as to whether the farmer is actually translating into practical action the discoveries and teachings of science. That thought raises the further thought as to whether these discoveries are being communicated promptly to the producer in that simple, concise and illustrative way which makes them easily grasped and strikingly appealing; whether facilities exist to make it possible for the farmer to follow the teachings; if the facilities do not exist, what action is being taken to create them? Unless there be effective linking of the discovery of the scientist with the practical application of the producer, much of the scientist's work must go for nought and the producer will continue to suffer when he need not. And remember that statistics tell us that approximately 40 per

cent. of our male bread-winners are engaged directly or indirectly in primary production. What, then, would be the best form of link between the scientist and the producer? The technical officers of the Department of Agriculture do what they can, but even they, perforce, often have difficulty in keeping abreast of new developments; opportunities for doing so are not always available; nevertheless, the trained instructor appears to be the corollary to the trained investigator. Confining ourselves particularly to Queensland, the time seems to have come when we should try to sift carefully the discoveries of science which are of the highest value to primary production, and determine ways and means by which the lessons can be driven home with force and vigour. Something more is needed than mere sermonettes on a subject such as 'Farming on Scientific Lines.' If it be worth while to engage scientists to discover new facts and new processes, it is surely worth while to develop schemes by which proved methods may be put into practice. But these things should not be left entirely to the State. Commodity Boards and kindred bodies have their obligations; they have their part to play and they should play it. In my limited sphere I shall help as much as I can. As a layman I have approached this subject with some diffidence; but even a layman gets a point of view which escapes the expert."

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**Rhodesian Tobacco.**—We have been favoured with a set of illustrated cards (stiffeners as they are called in the "trade") which are enclosed in the packets of Rhodian cigarettes sold at Home. This series depicts the fauna of Rhodesia, a feature being the personal note introduced in the description given on the back of the card. For instance, we are informed in respect of the monitor that "the writer once saw a monitor cross a verandah, seize a favourite cat and disappear down some steps with such lightning-like rapidity that he was powerless to intervene." Similar references are made in regard to other animals, and they certainly add a distinctive note to the subject matter. Some of the specimens are stuffed, but on the whole the pictures are true to life and are a credit to the firm which has placed this Rhodesian cigarette on the market.

Although there is still a very large quantity of Rhodesian tobacco unsold in England, it would appear that our leaf is steadily gaining in popularity, and will in due course be absorbed. We note that the Admiralty in January took 100 bales of flue-cured Rhodesian strips, another instance of the desire of His Majesty's Government to help the tobacco industry of this Colony.

From the admirable statistics compiled by Messrs. Frank Watson & Co., Ltd., on Empire tobacco, it is seen that from 1st January to 30th November, 1928, 41,762,801 lbs. of tobacco were imported from Empire sources, as against 40,942,102 lbs. in the whole of 1927. The greatest individual score in the 11 months of 1928 was that of Nyasaland, which sent over 13 million lbs. Then comes Southern Rhodesia, with 9,549,946 lbs. British India followed up closely with 9,274,815 lbs. Canada's contribution was 5,963,381 lbs., and that of Northern Rhodesia was 1,740,462 lbs. Cyprus showed a decided advance—from 93,366 lbs. in 1927 to 210,788 lbs. for the January-November period of 1928. The percentage of clearances of Empire tobacco to total clearances, which is, of course, the gauge to consumption, is given for November, 1928, at 18.53 per cent., this being a record. The figure has fluctuated between 15 per cent. and 17 per cent. through the various months of last year, leading up to the unprecedented November figure. The use of Empire tobacco last year was decidedly greater than in previous years, comparing favourably with 14.71 per cent. for the whole of 1927 and 13.10 per cent. for 1926. The extension in the use of leaf from Empire countries has been rapid and constant; in 1919 the proportion was only 1.01 per cent.

*Tobacco*, the well known trade journal, comments as follows on the position revealed by these figures:—

"The conviction throughout the trade, both in manufacturing and distributing quarters, that Empire leaf has come to stay, is thus well supported by the course of trade. We talk about propaganda for this, that and the other product, but here we have an example of a new source of supply which is going ahead, impelled both by propaganda and also by its inherent merits, aided by preferential taxation. We state that, from the marketing point of view, there is not only this material success to be recorded, but that everything

points to Empire leaf increasing its hold and extending its vogue. It is a great pity that over-production has occurred in some of the tobacco-growing areas of the Empire. The optimist, we were reminded the other day by a great ship-builder, is one who makes an opportunity out of a difficulty. Some of our Empire growers over-estimated the immediate requirements of the market, but they did make an opportunity out of the marketing difficulty. They temporarily overdid it. However, now that the market is responding so well, the best tobaccos from the Empire will be more and more in demand."

## A Further Tribute.

*A subscriber from Northern Rhodesia writes:*

*"Enclosed please find cheque to the value of 10s., being subscription for two years for the* Rhodesia Agricultural Journal. *I would like to state how useful I find the Journal and how I look forward to it each month. The 'Farming Calendar' alone is worth the money. I appreciate the Journal very much."*

# Tobacco Culture in Southern Rhodesia.

## COMMON FAULTS IN CURING VIRGINIA BRIGHT TOBACCO.

By D. D. Brown, Chief Tobacco Expert.

The following notes dealing briefly with several of the common problems and some of the faults made in flue curing may possibly be of assistance to tobacco growers at the present time.

Many of the difficulties in the curing of tobacco may be directly traced to the field. For instance, such factors as unsuitable soil, fertilisers, field management and adverse climatic conditions all exercise some influence on the standard of curing operations.

**Soil.**—The use of unsuitable soil is a matter which can, in most instances, be eliminated by a more careful selection of land for the type of tobacco to be produced. The class of soil upon which it is grown largely influences the type of leaf produced; it is therefore not considered sound practice to plant tobacco on a heavy soil and endeavour to force the resulting leaf to cure a very bright colour. Exceptions to the above rule do occur, especially when virgin land is used. Under these conditions and provided seasonal conditions are favourable, general experience has proved that the first crop tends to produce a fair percentage of bright coloured leaf; the tobacco planted during the following season, however, usually produces a heavier bodied and darker coloured leaf. Any attempts made by the grower to force the second crop to cure as high a percentage of bright leaf as was secured from the first crop grown on the same land, are almost cer-

tain to result in disappointment and financial loss through a reduction in quality. The use of an excessive quantity of moisture for a prolonged period and an extended period during which the leaf is submitted to the heat of the barn are detrimental. Tobacco treated in this manner is generally neither one thing nor the other, and besides being unattractive in appearance, is also dry and brittle.

An experienced grower can usually determine by the appearance of the tobacco in the field whether the bulk of the leaf is naturally inclined to cure bright, medium or dark, and arranges his curing accordingly. Speaking generally, the lower leaves tend to cure bright, the middle leaves produce medium grades and the upper leaves cure into darks; therefore leaf harvested from different parts of the plant should not be placed in the same barn for curing.

**Fertilisers.**—The choice of fertiliser must of necessity be governed by the type of land used for the crop. It has been found that a complete fertiliser containing a combination of both organic and inorganic nitrogen-furnishing elements is very suitable for use on the lighter types of sandy soils, the majority of which are of granitic origin. Sandy loams and clay loams of medium fertility respond favourably to applications of complete tobacco fertilisers containing either a percentage of organic nitrogen or the total percentage of nitrogen derived from an inorganic source. On the heavier textured and more fertile soils, however, a double complete tobacco fertiliser in which all the nitrogen requirements are derived from an inorganic source is generally favoured, or special mixtures similar to the above, only that the percentage of nitrogen may be less.

Organic nitrogen forms an essential part of the fertilisers supplied, especially for dark fire cured tobacco, where the requirements are rather different from those for flue cured tobacco.

Apart from the choice of a suitable fertiliser, there is the application of adequate dressings; inadequate applications are false economy, whilst, on the other hand, excessive quantities are wasteful. Owing to the varying degrees of inherent fertility of the soil it is not possible to state the quantity of fertiliser which is to be applied. Only actual

trial will enable each individual tobacco grower to determine the quantity of artificial fertiliser which will produce optimum results.

The continued application of artificial fertilisers is in itself not sufficient, and, if continued for too lengthy a period without any provision being made to maintain the humus content of the soil, will actually be detrimental.

**Field Management.**—Thorough preparation of the land in the first instance, followed by proper cultivation and cultural methods, will materially influence the results of the subsequent curing operations. The crop is then more likely to make continuous and more even growth, which will give greater uniformity in the leaf. A plant correctly primed and topped will ripen more uniformly and produce better tobacco than a plant which is unprimed and topped either too high or too low. The time of planting is also important; less difficulty is usually experienced in curing tobacco planted during the earlier part of the season than with the later planted portion of the crop.

**Climatic Conditions.**—During seasons when climatic conditions are unfavourable it is usual to expect certain difficulties in the curing of the crop. Should a prolonged dry spell occur when the tobacco is reaching maturity, the leaf turns yellow and commences to perish on the plant. This type of leaf when placed in the barn yellows well and retains a good colour until the temperature of the barn is raised approximately to 130° F.; at this stage a change in colour is often observed, the leaf turning green and curing out with a decided greenish tinge. This is due to the leaf being immature; the yellow coloration in the field is an indication of the plant perishing, though it is often mistaken as a sign of ripening. When false ripening is in evidence the harvesting is best delayed for a short while, say, a week or ten days, as very frequently a shower of rain will arrive in time to prevent the plants from dying off any further. Should the dry weather continue, or the leaves begin to deteriorate rapidly, the only course is to proceed with the reaping. The incidence of heavy or continuous rains after a dry spell will induce second growth, which makes the leaf very difficult to cure, and very often such leaf will fail to cure at all. When attempting to cure tobacco of this nature a slow rate of curing

is essential until the requisite yellow coloration is obtained; care should also be taken not to rush the temperature up too fast before all the green possible has been eliminated. It is sometimes advisable to yellow the leaf first by hanging the sticks in a wilting shed before placing the tobacco in the barn. During seasons of heavy rainfall the tobacco in the field will sometimes turn yellow prematurely, though in this instance it is generally found that the curing yields more satisfactory results than is the case when drought prevails.

Every effort should be made to eliminate or reduce to a minimum the green tobacco irrespective as to whether the season be favourable or otherwise, even though this be only attained through sponging some of the leaf. Sponged tobacco retains a commercial value, whereas green tobacco is practically valueless.

**Harvesting and Curing.**—Leaf fully ripe and of uniform body and texture should be reaped for each barn; reasonable care exercised in this respect will materially assist in the curing operations. Damaged and inferior leaf is often harvested and used in place of better leaf which, if left on the plant too long, loses quality. The leaves to each hand should be placed back to back when tied on the stick; the number of hands should fill the stick without overcrowding. When filling the barn the tobacco sticks should be evenly spaced along each tier and overcrowding the barn avoided. The leaf is more liable to "sponge" in an over-filled barn and during wet weather "pole sweat" will occur. The amount of "sponging" can usually be controlled by opening the ventilators and slightly increasing the temperature; increased ventilation and temperature, with a reduction in the relative humidity, is also required to control "pole sweat."

Bottom ventilation must be carefully regulated when the outside atmosphere is either saturated or extremely dry; under these circumstances it is often advisable to keep the lower ventilators closed or only very slightly opened. When little or no bottom ventilation is used, it is necessary to commence ventilating at the top as soon as the temperature in the barn is 100° F. to 105° F., if the leaf shows any signs of sponging. The top vents are at first opened very little and the aperture gradually increased as the curing proceeds. The above method is useful in eliminating a certain amount

of the green when a mixed barn is being cured. The timely use of top ventilation to prevent the yellow leaf from "sponging" and a minimum of bottom ventilation prevent the atmosphere of the barn from drying too rapidly, thus leaving the greener tobacco more opportunity for "yellowing."

Under normal conditions the tobacco grower should use his standard methods and formulæ which personal experience has proved to yield the most satisfactory results in curing the crop.

The provision of warm air ducts leading into the barn will also enable the grower to cure his leaf to better advantage. This system is recommended in place of the present practice wherein cold air is commonly introduced into the barn.

An excessive quantity of water thrown on to the floor will induce "sponging," particularly in the case of earth floors. It has often been observed that a thoroughly saturated earthen floor causes difficulty in reducing the relative humidity when the temperature has reached 130° F. approximately. At this temperature a great deal of moisture is driven out of the floor; hence the increased humidity within the barn, even though the same barn appeared to have the correct degree of relative humidity at, say, 120° F. to 125° F. Brick floors should be provided with a thin coating of cement for preference, as it is then easier to control the humidity, especially if drain plugs are let in through the walls to run off surplus water when it is no longer required in the barn.

As the curing season progresses the rate of curing gradually becomes slower, the leaf takes longer in colouring and fixing the colour. A great deal of damage to the tobacco is incurred through raising the maximum temperature too high during the final stages of curing. A maximum temperature in excess of 160° F. should not be permitted, as higher temperatures will rapidly cause the leaf to deteriorate, rendering it dry and brittle, besides scorching it to some extent.

After the tobacco is cured it is a common practice to bale the leaf immediately after it is removed from the barn and has been "conditioned," the reason usually advanced for this procedure being lack of storage room. Whilst

tobacco in bales might possibly require less floor space for storage, the saving in space is not always so great as is imagined; in fact the reverse is often the case. The practice of baling before grading is to be deprecated, as this method entails a deal of wastage, besides rendering subsequent grading more difficult owing to the tobacco having been tightly pressed and the leaves in consequence being hard to separate. Another disadvantage is also apparent when the tobacco has been baled too dry to improve in colour and aroma.

When "bulked" the tobacco can be "conditioned" to a correct degree which fulfils the requirements of the type of leaf, and if properly handled the tobacco will improve more rapidly. There is also less cause for wastage and the tobacco is more easily examined in the bulks than when in bales. If the tobacco is roughly graded into brights, mediums, darks and greens prior to being "bulked," much time will be saved in the final grading, and the bulks containing only one class of leaf can be handled to better advantage. The bright bulks would naturally be those first chosen for final grading and baling, followed by the mediums, darks and greens in the order stated. When only one class of tobacco at a time is being handled, less difficulty in grading is experienced by unskilled native graders.

Steam, superheated or used in excess, is also liable to reduce the quality and value of the leaf.

In conclusion, it is not suggested that the above notes deal completely with the subject under review, and reference therefore should be made to previous articles on tobacco culture published in the *Rhodesia Agricultural Journal*, from which reprints are available in bulletin form.

# Soil Erosion.

*(Concluded.)*

By P. H. Haviland, B.Sc. (Eng.), A.M.I.C.E., Acting Government Irrigation Engineer.

**Contour Ridges.**—Undoubtedly the most efficient method of preventing washing on cultivated lands with any appreciable slope, having regard to cost, is by the construction of contour ridges. This statement has been definitely proved on a great number of farms in this Colony, where the system is in use at the present time. Contour ridges have been in existence since 1923 on one farm, and the owner has never regretted their construction. At the present time a total length of about 10,000 yards is in existence on this property.

As stated previously, the greater the volume of water flowing over land, the greater will be the erosion. The one object attained by contour ridging is the division, into small controllable volumes, of the total water flowing off cultivated lands, and the second object is the collection of silt behind the ridges.

Contour ridges may be briefly described as long, low mounds of earth running on a grade across the slope of the land, behind which the silt collects and the surplus storm water drains off. Illustrations of a contour ridge are shown in the accompanying illustration.

*Land Requiring Contour Ridging.*—Almost without exception all land with a slope steeper than 1 in 40 will require contour ridging, and it is found that the greater portion of the rich arable lands in this Colony have slopes much in excess of this. In many parts farming operations are carried out on lands with an average slope of 1 in 15 to 1 in 20, and erosion is taking place in these areas to a marked extent. Soil washing may not be apparent to the casual

observer, but to the experienced person the results of the evil are readily noticeable. Instances are common of the drop in crop yield, actually due to denudation, being placed at the door of inefficient fertilising and other causes. It must be obvious that the improvement of soils by means of artificial fertilisers, green manuring and other methods can never prove successful as long as water is permitted to remove the surface soil from cultivated lands.

*Details of Ridges.*—A cross section of a contour ridge is shown in Figure VI., and in Figure VIII. a typical layout of a land with contour ridges and storm drains is shown in plan.

Contour ridges should be constructed with a final height of 18 inches to 2 feet, a top width of 2 feet and a base width of about 10 feet. A base width of 8 feet may be employed for ridges 18 inches high, but the broader based construction is without doubt more efficient.

*Grades and Distances Apart.*—From general practical considerations it has been found that the most suitable grades on which to place contour ridges is 1 in 300 or 1 in 400. On land which is capable of heavy absorption of water the flatter grade may be used, but on land which will not absorb much moisture the grade of 1 in 300 should be employed. Steeper lands in general should be given a steeper grade.

The distance between successive ridges is a very important point to be considered, and under no circumstances should they be set further apart than 100 yards. On steeply sloping lands the ridges must be placed nearer to each other than this, and the following table may be used as a general guide as to distance:—

| Slope of land. | Distance between successive ridges. |
|---|---|
| 1 in 40 ... ... ... ... ... | 100 yards |
| 1 in 30 ... ... ... ... ... | 75 yards |
| 1 in 20 ... ... ... ... ... | 50 yards |
| 1 in 15 ... ... ... ... ... | 35 yards |

The ideal would be to set contour ridges at such a distance apart that the toe of one ridge is at the same level as the top of the next. This, however, in most cases is not possible on account of the steep slopes met with, which would necessitate ridges being placed so very close together

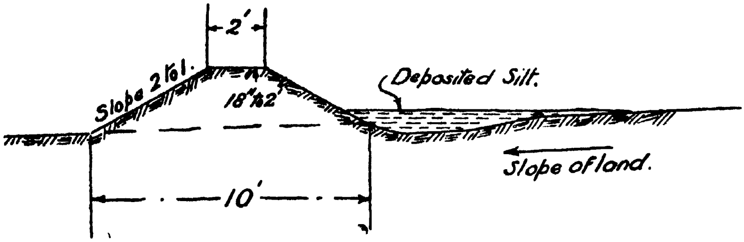



Fig. VI


Correct method.


Incorrect method.

Fig VII

that the cost of farming operations would be increased to such an extent that they would not be economical.

The location of ridges may be decided upon, in many cases, by an examination of the effects of erosion which has already occurred. As a rule small wash-outs, possibly 1 to 2 inches deep or more, are readily noticed before ploughing lands from which crops have been reaped. . If such wash-outs are carefully traced to their sources a contour ridge placed a short distance above will usually be found to be located correctly, and the distance to be adopted between ridges will be the distance between the ridge so located and the storm drain at the head of the lands.

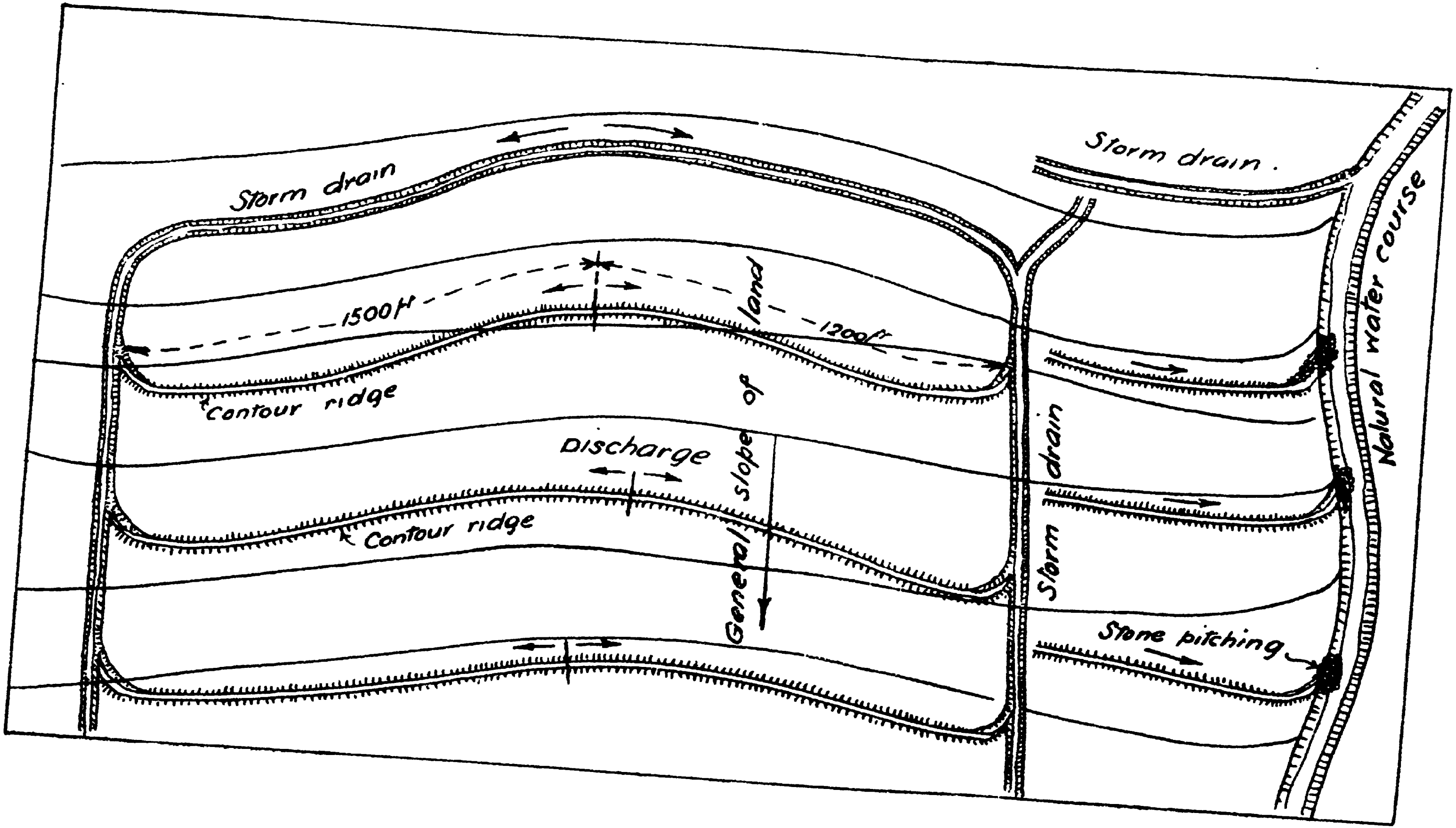
*Length of Ridges.*—It is essential, for satisfactory operation, and to reduce the possibility of bursts occurring, that no ridge should be longer than 1,500 feet, if discharge is to take place at one end only. A ridge of a total length of up to 3,000 feet can be constructed if discharge takes place in both directions.

As a general rule the longer the ridge the shorter must be the distance between ridges. The table of distances given under the preceding sub-heading applies to ridges of 1,200 to 1,500 feet in length and if shorter ridges are made these distances could be somewhat increased.

The length of a ridge is also dependent upon the type and state of the soil, which has a direct influence on the amount of run-off occurring after rain; the less the absorbing power of the soil the shorter the ridges will have to be.

*Setting out the Lines of the Ridges.*—Contour ridges are most conveniently set out by means of an engineer's level, and, should a farmer be so desirous, contour ridges and drains can be set out by an Engineer of the Irrigation Branch, a fee being charged in accordance with regulations.

The most convenient method of staking out is to place pegs on the correct grade at distances apart of 100 feet. The grade location may be made on ground levels, care being taken to ensure the foot of the staff being placed at the average ground level for such point. This, when pegging ridges on ploughed land, is most important. As each peg site is located, the peg should be driven in so that the top of the peg is at the height above the ground to which the


Storm drain
Storm drain.
1500ft
1200ft
Contour ridge
Discharge
Contour ridge
General slope of land
Storm drain
Stone pitching
Nalural water course

completed contour ridge must be constructed. If this is done, the top of all pegs will also be on the correct grade.

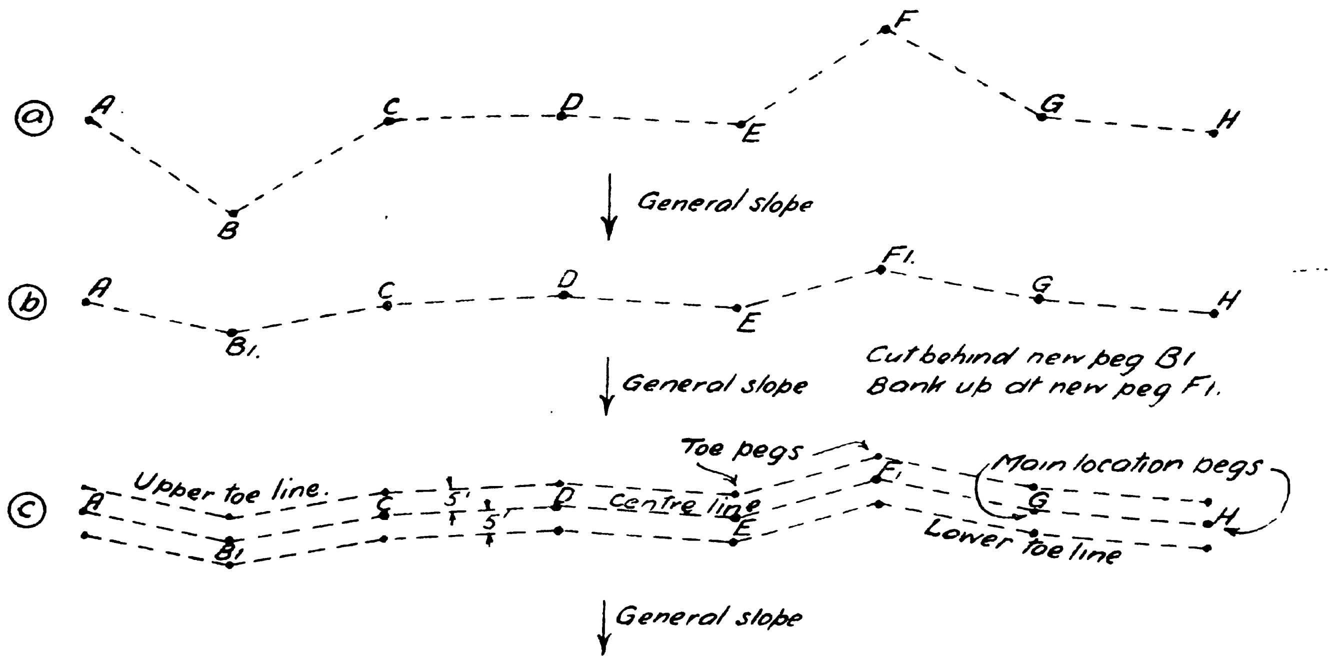
Having pegged out the ridge initially, it will often be found that very sharp angles occur in the pegged line, and awkward curves would result were this initial location to be adopted finally. An examination will show that by moving one or two pegs up or down the slope, easy curves may be obtained, and this may be done provided a cut behind the ridge is adopted or the ridge is raised, at the pegs which are moved. If a peg is moved up the slope, the ground behind the ridge line must be trenched down, and if a peg is moved down the slope, the bank must be raised. Such alterations are shown in Figure IX. (a) and (b). In altering the position of a peg, the new peg must be placed with its top level with the top of the original peg which was placed on grade. The depth to trench is such a depth as will make the distance from the top of the peg to the bed of the cutting behind the peg the same as the height of a normal contour ridge bank above the ground level immediately behind.

When crossing depressions with a ridge, the bottom width of the bank must be increased in proportion to the increased height. Side slopes of 2 to 1 should be adhered to in all cases. Care must be taken to see that such high banks are placed on ground from which all vegetation has first been removed, all holes filled up and the whole surface roughened before the earth is placed.

An alternative method of pegging out is by means of an "A" frame as described in the article "Irrigation Canals," which appeared in the *Rhodesia Agricultural Journal* of January, 1928, and was reprinted as Bulletin No. 670.

*Construction of Ridges.*—For convenience in working it is advisable to place pegs in the ground where the upper and lower toes of the bank will start. That is, for a ridge 2 feet high with a total base width of 10 feet, short pegs are driven in the ground above and below the main location pegs and at a distance of 5 feet from the location pegs. This is illustrated in Figure IX. (c).

The cheapest method of construction is by using a ditching-terracing implement of the type which has a cutting edge formed at the apex of two broad blades, by one of which the earth excavated is moved to one side. It is advisable to form




D

Fig. IX.

(a) Initial location. (b) Final location—pegs B and F moved to B1 and F1. (c) Final location, showing pegs marking toes of bank.

the ridge of earth obtained from both above and below the location line, but rather more earth should be taken from the higher side, as this will be easily and rapidly replaced by the silt deposited behind the bank.

The first furrow should be cut about 12 feet above the upper toe line of the finished bank, and the earth thrown up is collected on its return journey by the ditcher which moves it, together with the next lot of earth, nearer the bank location. To begin with, the ditcher can be carried right round the ridge location, if the machine is reversible, that is, the implement first travels on the upper side of the locating pegs, turns at the end, and travels back along the lower side of the pegs.

It is not possible completely to finish off a contour ridge with a ditching implement, and hand labour should always be used to trim the bank off.

When the bank is nearing its final height it is advisable to place short pegs in the earthwork between the main location pegs, and set the tops of these small trimming pegs on grade by means of "boning rods." The use of the "boning rod" is very simple. A "boning rod" is a "tee" made of two pieces of timber, the horizontal portion being of any convenient length, say 18 inches to 2 feet, and the vertical arm about 2 feet 6 inches to 3 feet in height. It is usual to use three "boning rods," and each one must be of exactly the same height. An illustration of their use is shown in Figure X. A "boning rod" is placed on the top of each of two successive final location pegs and a sight taken over the horizontal shoulders. The third "rod" is set on the top of a trimming peg between the other two "rods" and the trimming peg knocked in till the shoulder of the intermediate "rod" is on the "line of sight." When this occurs the top of the trimming peg is on the same grade as the top of the final location pegs. The top of the contour ridge is then brought up to the top of the trimming pegs.

All contour ridges must be constructed of earth well broken down, and no hard, solid lumps must be placed in the embankment. No stones or rocks must be embodied in the construction, as these form danger points, often permitting of the passage of water through the ridge.

In removing earth from the top side of the ridge care must be taken to prevent a definite ditch being constructed,

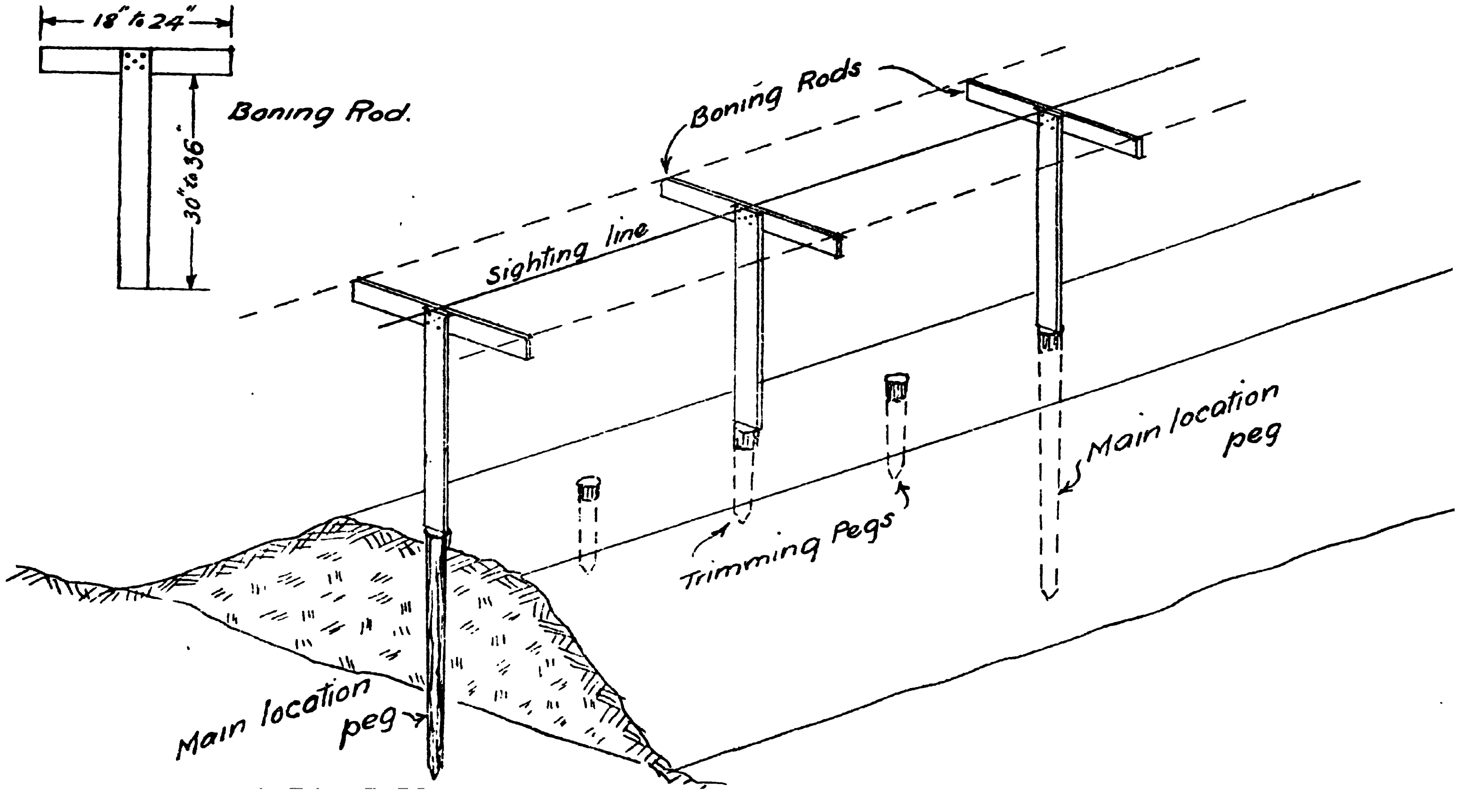

18" to 24"
Boning Rod.
30" to 36"
Boning Rods
Sighting line
Main location peg
Trimming Pegs
Main location peg

Fig. X.

and the bed behind the bank must slope gradually up to meet the natural ground surface. This is illustrated in Figure VII.

It is imperative that no vegetation such as grass, tree stumps, etc., be placed in the earth bank, as such matter decays and leaves openings into which water may penetrate with the possibility of a burst occurring.

*Crops on Ridges.*—Almost any crop may be planted on the contour ridges and such crops may be permanent or annual. The majority of farmers prefer to plant a crop on the ridge similar to that growing between the ridges. It is not desirable to plough the ridges at any time, and they must certainly never be ploughed till they have been in existence for at least twelve months.

Cultivation along the ridges may be carried out and does not present any great difficulty, if ridges are of the cross section advised in this article.

Napier fodder, bamboo and sweet potatoes are suitable crops for ridges, the last-named being grown as a grazing crop, that is, left in the ground permanently. These crops bind the ridges, and if Napier fodder and bamboo are planted they will act as wind breaks. Mulberries are also useful and grow easily from cuttings.

*Discharge from Contour Ridges.*—The discharge from contour ridges may be effected into artificial storm drains or natural water courses, and very occasionally on to virgin veld which has a good vegetal covering.

In discharging into storm drains, the bed behind the ridge must continue on grade right into the bed of the drain, and no sudden drop down at the end of the ridge must be permitted. The construction will gradually change from a bank into a cut; that is, the top of the artificial embankment will get nearer and nearer to the natural ground level, while the bed behind will be cut gradually deeper into the earth till it runs into the storm drain bed at the level of the latter. This will cause a slight turn up of the ends of the contour ridge as shown in Figure VIII. The last 100 feet of the ridge may be set on a slightly flatter grade than the remainder, but never on a steeper grade.

Where a ridge discharges into a natural watercourse, and it is not possible to carry the bed of the ridge on grade right into the bed of the watercourse, protection against erosion of the watercourse bank must be resorted to. This

Typical ridge terracing, as constructed on Mr. G. Rattray's farm Kingston, near Bindura.

can most conveniently be effected by stone pitching, either "dry" or cement grouted as shown in Figure VIII.

A natural watercourse must not be overloaded beyond its natural carrying capacity, by discharging contour ridges and storm drains into it, unless precautions are adopted to prevent erosion in the bed and along the banks.

*Cost of Contour Ridges.*—Contour ridging is *not* expensive, as has definitely been proved in practice by farmers themselves.

Below are given actual incurred costs of construction of contour ridges with base widths of 12 feet, top widths of 2 feet and heights of 1 foot 9 inches, first by hand labour only and secondly by using a ditcher and finishing with hand labour:—

*Cost of constructing 1,781 yards of Contour Ridging: Hand Labour only.*

*Period to complete: 12 days.*
*Daily average number of natives: 32.5.*

| | £ | s. | d. |
|---|---|---|---|
| Native wages ... ... ... | 8 | 15 | 0 |
| Native rations ... ... ... | 3 | 2 | 6 |
| Farm assistant's salary | 8 | 13 | 0 |
| Engineering fees ... ... | 1 | 10 | 0 |
| Total ... | £22 | 0 | 6 |

Cost per running yard ... ... 2.97 pence.

*Cost of constructing 2,109 yards of Contour Ridging: Ditcher and Hand Labour.*

*Period to complete: 9 days.*
*Daily average number of natives: 30.*

| | £ | s. | d. |
|---|---|---|---|
| Native wages ... ... ... | 5 | 12 | 6 |
| Native rations ... ... ... | 2 | 0 | 6 |
| Farm assistant's salary (8 days) ... ... ... ... | 5 | 6 | 8 |
| Engineering fees ... ... | 1 | 10 | 0 |
| Ditcher for three days at 3s. 3d. per day | 0 | 9 | 9 |
| Total ... | £14 | 19 | 5 |

Cost per running yard ... ... 1.66 pence.

It will be seen from the above that a saving of 1.31d. per running yard was effected by using a ditcher. The actual saving for a mile of contour ridging would be about £9 12s. 1d. It thus obviously will pay the farmer to purchase a ditching implement.

Other common figures for the construction of ridges by hand labour only vary from 3d. to 4d. per running yard.

The general average cost of protecting land by contour ridging varies from 9s. to 16s. per acre, depending on whether ditching implements are employed or only hand labour is used, and assuming that ridges are situated at 75 yards apart. With ridges further apart the cost per acre is decreased.

*Maintenance.*—The maintenance of contour ridges costs very little per annum, but is essential.

Natives will invariably be found excavating in the ridges for small field vermin, and care must be taken to prevent this as far as possible and to make good any damage before the advent of rains each year.

An annual inspection of all contour ridges should be made previous to the rains and all holes, subsidences and agricultural machinery tracks made good.

It is essential that one or two inspections be made during the rains and the banks carefully examined for dangerous features which may form the causes of the ridges bursting.

**Gulleys and Small Washouts.**—A gulley or "donga" which has not got beyond control may be prevented to a great extent from further erosion by making it "step down," that is, by forming steps in the bed, the stretches between steps being either level or on a gentle grade. This is best achieved by means of boulder-net weirs constructed across the gulley. These boulder-net bolsters are formed by enclosing well packed boulders and stone, of as large a convenient size as possible, in wire netting. Pig netting may be used, or else a network may be made of fencing wire, the strands being twisted at all intersections.

A trench is first excavated across the gulley bed to a depth of 9 inches to 1 foot. Wire netting is then laid in this trench and the stones well packed in. It is advisable to pack the stones in concave layers, so that there will be a tendency for them to pack more tightly towards the centre line, under

their own weight. The layers are placed extending right across the gulley and the concavity is formed by each layer sloping down from the up-stream and down-stream edges of the trench to the centre line running across the donga. When the packing is completed, the netting is brought up each face of the bolster and laced with wire at the top. Boulder-net weirs should not be higher than 2 feet for any one season, that is, 2 feet above the natural bed of the gulley. If silting is complete after one wet season, further bolsters, to a height of another 2 feet, may be placed slightly up-stream of the original one. This will form a step with a sloping down-stream face. When placing such bolsters across the bed of a gulley it is also necessary to cut trenches down the banks from the top to the bed and place boulder-network in these, in order that the water may pass through an opening which will not erode (see Figure IV.).

A further necessary precaution against erosion is to set stone pitching immediately below the weirs in order to prevent potholes from being scoured out by the falling water. The planting of timber along the sides of dongas and the encouraging of the growth of vegetation on the sides and in the bottoms are also advocated. Small washouts in the land itself may be stopped in a similar way by small boulder weirs or earth banks placed at close intervals across them.

Another method of silting up these small washouts is to place a row of timber stakes across them. These must be well driven into the ground and should not project more than 9 inches to 12 inches above the ground surface. Light branches, etc., are then intertwined through the stakes and the silt is held up behind these barriers. This method is often employed where rock is unobtainable in the land itself. Great care, however, must be taken to see that the stakes are driven well down. In driving the stakes in, the tops of those in the centre should be lower than those nearer the sides, thus forming a dished-out opening. This minimises to a great extent the "cutting round" the stakes, which often otherwise occurs.

Another temporary and effective method of silting up small washouts is to cut down branches of trees and stake them in the bottom of the washout, with the smaller branches and twigs pointing up-stream.

Erosion of the banks of gulleys, etc., may be prevented by constructing hurdles of stakes, with brushwood and grass intertwined, and staking these hurdles along the faces of the banks. For large gullies, the only method of preventing further growth and causing silting up is by the construction of concrete or masonry weirs. Special designs are necessary for these and could be prepared in the Irrigation Office. Initially, however, an inspection by an Engineer will be necessary.

**Roads.**—The efficient protection of farm roads is a subject which is often not considered in any way. It is of great importance and should receive the attention of all farmers. Proper drains should always be provided. If this is not done the road itself develops into a donga and becomes useless for the purpose of transport. When this occurs, the usual practice is to make another road next to the original, and this continues *ad infinitum*. Road drains, where necessary, must be stepped down and should discharge at as many convenient points as possible. The road surface itself should be slightly cambered; this prevents water standing on the road and eventually forming a quagmire.

**Cattle and other Tracks.**—It is very undesirable to have any permanent cattle or similar tracks through cultivated land, as these will develop rapidly into washouts. Permanent tracks through the lands to dips or watering places are often seen on farms, and this deplorable practice should be stopped before the damage done becomes too great to remedy.

**Conclusion.**—The best advice that can be given to farmers is to *do a little every year and adhere to a definite programme.* It has taken many thousands of years to produce the rich soils of this Colony, and the soil filched by uncontrolled erosion can never be replaced in a man's lifetime.

# Wheat.

## A STUDY OF THE PLANT, ITS SEED, AND AN ACCOUNT OF EXPERIMENTS BEING DONE TO TRY TO PRODUCE A VARIETY SUITABLE FOR SOUTHERN RHODESIA.

By T. K. Sansom, B.Sc. (S.A.),
Southern Rhodesia Government Research Student, Gatooma (January-September, 1926); Plant Breeding Institute, University of Cambridge (October, 1926-October, 1928).

Wheat (*Triticum*) is an annual. Under cultural conditions in Southern Rhodesia there are two seasonal forms, winter annual or winter wheat, and summer annual or summer wheat.

A brief sketch of the origin and uses of wheat will be of interest.

**Origin of Wheat.**—It is generally conceded that wheat is indigenous to Syria; a few years ago a wild emma wheat was brought from Syria, and later an expedition in Upper Galilee, to the north of Lake Tiberias, found this same emma again. It is considered that the form of the fragile "rachis" (the axis of the spike) is the primitive type of wheat. However, it is well agreed that the prototype of our cultivated wheats, whatever it is, is one with a fragile rachis. The rigid rachis is considered to have been developed by man. In wild wheats cross pollination is more frequent than in the cultivated forms, but this is probably due to the fact that it grows in a warm dry climate. In India cross pollination in wheat is more frequent than in northern or colder climates.

There has been much discussion concerning the vitality of wheat grain, and frequent claims are made that grains

from ancient tombs still possess the capacity of germination. However, all tests made with grains of wheat from ancient tombs have shown that such grains are dead. Percival states that "modern wheat grains appropriately stained have sometimes been fraudulently mixed with wheat from ancient vases, the whole being sold to the credulous tourist as 'mummy wheat,' or introduced in mummy cases or placed within the wrappings of mummies."

It has been demonstrated that under ordinary storage conditions wheat has its germinating capacity greatly reduced or entirely destroyed in eight or ten years.

**Uses of Wheat.**—By far the largest proportion of the world's supply of flour is made from wheat. The hard wheats, particularly the "durum" varieties, are used extensively in the manufacture of macaroni and similar products. In the manufacture of macaroni, the wheat is first ground into a coarse product known as "semolina." The semolina is mixed with about 30 per cent. water, worked into a stiff dough, and given a thorough kneading. The dough is then forced through a press from which it issues in long hollow tubes.

Vermicelli and spaghetti are also made from semolina and water, but undergo a slightly different process. Many breakfast foods are made from wheat; a very recent production is puffed wheat, in the preparation of which the kernels are expanded by heating to a high temperature under pressure, and then the pressure is suddenly released. The use of wheat for making bread is known to all, or at anyrate should be.

Wheat, as well as other cereals, finds use in the manufacture of whisky. It is also employed in the making of weiss-beer malt.

Among the cereals the world production of wheat is only very slightly exceeded by that of maize. Although maize is a very valuable foodstuff, its principal use is for stock feeding, whereas wheat is the most valuable of all cereals for human consumption. Western civilisation in the past and present has been due to a very great extent to the value of wheat and its products as an article of diet for the human body.

**Roots.**—Wheat has a fibrous root system. In the germination of the grain, the primary root takes the lead, and often two pairs of lateral roots appear on each side of the primary. These roots belong to the temporary root system and usually die before the plant is fully grown. *Permanent* roots arise later some distance above the temporary roots. The first whorl (ring) of the permanent root system is generally about one inch below the surface of the ground, no matter at what depth the grain was planted. The permanent roots in their development first curve outwards and then downwards, taking an almost vertical course. They branch very freely near the surface and constitute a large absorbing surface. However, many of the roots reach a depth of four feet and even more under favourable conditions. It is of interest that the total length of all the roots of a one-year-old plant amounts to between 600-700 yards. The number of roots increases with the number of tillers (stools), each tiller having its own root system.

**Stems.**—The stems are of the general grass type; there are usually six joints (internodes), the sixth being the one bearing the ear, and it is the longest. In most wheats the joints are hollow, but in a few varieties of macaroni and Poulard wheats they are filled with pith.

**Leaves.**—The wheat leaf is also of the general grass type. It is of interest to observe that the first foliage leaf differs from all the succeeding ones in that its apex is more blunt and stiff; it is believed that these characteristics enable it to push through the soil more easily.

**Ligule and Auricle.**—The ligule is a membranous or cartilaginous ring or fringe which is situated at the junction of the leaf sheath and the blade; it varies greatly in shape, size and hairiness.

The auricle is a more or less pointed, thin ear-like structure, projecting from the leaf edge at the junction of the sheath and blade; it also varies greatly in size. These two structures are of great value in determining different species of wheats and also serve as a very helpful guide in breeding work.

**Inflorescence.**—The wheat flowers are arranged in "spikelets," and the spikelets together constitute the "head."

The head varies very much in form, size and compactness in different types of wheat. Fifteen to twenty fertile spikelets is a fair average, but under favourable conditions, i.e., an abundance of water in the early stages of development, this has been found to increase the number of spikelets in the head. In wheats such as the common breed wheat and other varieties each stem produces one head only. The lower spikelets in a head are often sterile, and frequently the terminal (uppermost) spikelet is also sterile.

**Flower.**—About 86 per cent. of wheat flowers bloom during the daylight, the remainder blooming at night. It usually takes several days for a head to complete its flowering. Temperature and moisture are certainly the most important factors determining the time of blooming. It is most probable that there is a "critical period" in the life of the plant, at which the supply of moisture coming to the plant has the maximum effect in the production of flowers. This critical period is probably during the early stages of flower formation, quite a while before the time of "heading." In cold or wet climates self-pollination is the rule in all wheats; in fact only about 1 per cent. of natural crossing may occur. In hot climates, however, as in India, natural crossing is more frequent and may be the rule; this most probably explains the fact why wheats grown in S. Rhodesia are so mixed, and the need for proper systematic work to obtain a pure strain is evident.

**Tillers.**—It is common knowledge that nearly all plants produce side branches in regular order, and that these arise at the nodes (the junction of two internodes) along the stem. In the cereals this is not so obvious as in trees, for example, for the reason that most cereals produce branches from the lower nodes only. This branching of cereals and all plants belonging to the grass family is known as "tillering," "stooling" or "mooting," and the individual branches are known as "tillers"; the entire mass of branches is the "stool."

Wheat invariably produces a number of tillers, sometimes as many as 50; these tillers may in turn produce other tillers. The branches all appear to come out at one point, but in reality each tiller arises from the axil of a reduced leaf below the surface. The average depth of tillering in

FIG. 1.

FIG. 3.

FIG. 4 (a)

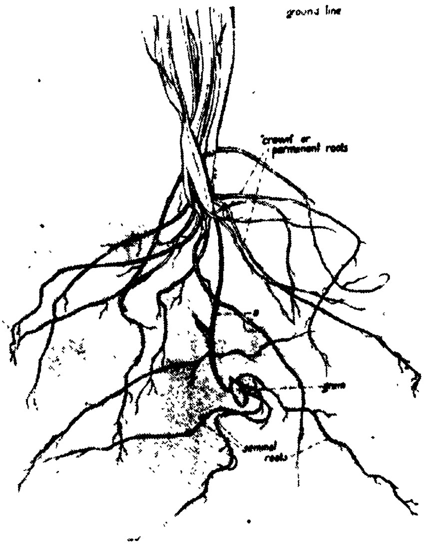



FIG. 4 (b)

FIG. 4 (c)

FIG. 2

Fig 1.—Wild emmer found in Palestine. Supposed to be the primitive type of wheat. Note fragile rachis. (From Robbins' "Botany of Crop Plants.")

Fig. 2. -Illustration to show that permanent roots were formed an inch below the surface, in spite of the seed being planted at too great a depth. (From Robbins' "Botany of Crop Plants.")

Fig. 3.—Apparatus arranged for a baking test; the loaves are in an incubator to rise before being transferred to the oven. (From T. B. Wood, "Story of a Loaf of Bread.")

Fig 4.—(a) Loaves made from best Canadian wheat; (b) loaves from average English wheat; (c) loaves from Rivet wheat. (From T. B. Wood, "Story of a Loaf of Bread.")

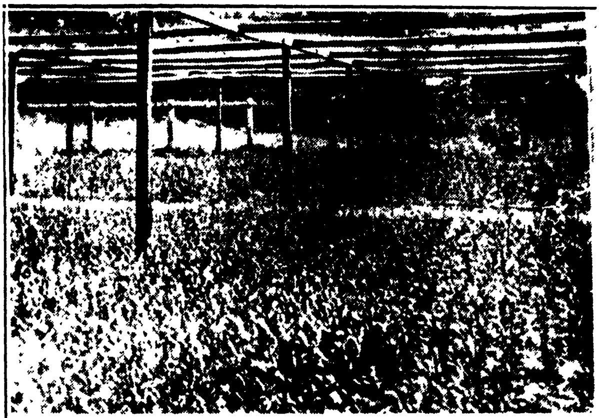


FIG. 5

FIG. 6

Fig. 5. Part of a bird-proof enclosure containing many small plots for variety testing. (From T. B. Wood, "Story of a Loaf of Bread.")

Fig. 6. Corner of a bird-proof enclosure; ears which have been crossed are tied up in paper bags. (From T. B. Wood, "Story of a Loaf of Bread.")

cereals is about 1 to 2 centimetres, regardless of the depth at which the seed has been planted.

Tillering activity varies with the species, individual and environmental conditions. In general, winter wheat tillers more than summer wheat, and bearded varieties have a greater capacity for tillering than beardless varieties; also there are fewer tillers per plant when planted close than when planted apart. Close seeding, however, results in earlier maturity and better quality than wide seeding. A plant which has numerous tillers does not ripen evenly; probably half the ears will be fit for reaping, whereas the remaining half will be still green. This does not mean that plants that tiller well should not be selected; the ideal plant should consist of from four to five tillers which ripen at the *same* time. Plants with many tillers ripen irregularly, and plants with fewer tillers give a low return of yield per acre. The production of tillers in the *small* grains is altogether desirable from the farmer's standpoint, as it is an important factor determining yield.

**Ripening Stages.**—There are four stages in the ripening of the wheat grain: (1) the green-ripe stage, (2) the yellow-ripe or "dough" stage, (3) the full-ripe stage, (4) the dead-ripe stage. In the full-ripe stage the grain becomes hard and firm and is usually harvested while in this stage. If the crop is left in the field until the dead-ripe stage the grain becomes brittle and losses from shedding or shattering may follow. The maturity of the grain appears to affect its vitality. Wheat collected in the dough stage yields an average of 25 bushels per acre, in the full-ripe stage 30 bushels per acre, and in the dead-ripe stage 28 bushels per acre. The dead-ripe stage produces the most vigorous seed, and any plants selected for seed should always be hung up until the grain is quite ripe.

**How Grown in Southern Rhodesia.**—A certain amount of wheat is grown under irrigation in Southern Rhodesia, but the bulk is produced in the sand veld areas. In these areas extensive vleis exist, which remain moist below the surface throughout the winter season. The rainfall during the summer months is a very important factor in the production of wheat in the moist vleis; a severe drought during the summer months will result in many of the vleis going out of

cultivation, and *vice versa*, a season of heavy and late summer rains will also affect the acreage and yield owing to the difficulty of working wet lands.

Wheat as a summer crop is generally grown from about the end of December to the middle of January, and whether it reaches maturity or not is dependent upon the rainfall of the season.

**Range of Cultivation.**—Wheat is one of the most adaptable of plants; it will grow on almost any kind of soil and in almost any temperate climate. Some varieties come to maturity and yield well as far as 64° N. latitude in Norway, and up to 8,000 feet elevation in the Central Rocky Mountains. But the question which concerns the wheat grower is not whether he can grow wheat, but whether he can grow it profitably.

**Type of Soil and Fertilisers Necessary.**—Although it cannot be said with finality on what land wheat can be grown or cannot be grown at a profit, nevertheless accumulated experience has shown that wheat grows best on the heavier kind of loam soils, where the rainfall is roughly between 25 to 30 inches per annum. It grows nearly as well on clay soils and on lighter loams, and with the methods of dry farming followed in the arid regions of the Western States and Canada it will succeed with less than its normal amount of rainfall.

In vlei lands in this Colony after one or two succeeding crops of wheat have been grown, the organic matter is greatly reduced and a poor average yield is the result; this proves the necessity of experiments with rotations and investigations to ascertain the most suitable fertilisers.

At Rothamsted experiments have been conducted over many years, and it has been found that the addition of a complete mineral manure containing phosphorus, calcium, potassium, in fact all the plant wants from the soil except nitrogen, only increased a crop from 13 bushels an acre to 15 bushels an acre. Manuring with nitrogen, on the other hand, the crop increased to 21 bushels an acre. When, however, a complete manure containing both nitrogen and minerals was added, the crop rose to 35 bushels an acre. This shows that although the yield of wheat is dependent in

the first place on the nitrogen supplied by the soil, it is still far from independent of a proper supply of minerals.

This kind of experiment has been repeated on almost every soil in England, and it is found that the inability of wheat to supply itself with nitrogen applies to all soils; the exception to this is the black soils of the Fens, which contain about ten times more nitrogen than ordinary soils. The large amount of nitrogen present in the soils of the Western States, Canada and Russia is one of the chief factors in their success as wheat-growing lands.

Most Rhodesian soils have a low percentage of nitrogen when compared with the soils of the large wheat-growing areas of the world; and the soils of the sand veld areas are exceptionally low in nitrogen; so that to grow wheat successfully in this Colony it would be necessary to apply a fertiliser rich in nitrates.

**Quality of Wheat.**—In a cross section of a mature grain of wheat the following layers may be recognised:—(1) Ovary wall, (2) testa, (3) nucellus; these three layers constitute the bran layer. Commercially speaking, bran consists of the scale-like, flaky outside covering; it varies considerably in chemical composition and hence in feeding value. (4) Endosperm. The endosperm constitutes about 92 per cent. of the grain's volume. The cereals are cultivated chiefly for the food material stored in the grain. The chief food materials stored in the endosperm are grains of starch and protein. As a general rule grains which have a marked glutinous or horny or flinty appearance are high in protein content, and those that have a starchy or dull appearance are low in protein content.

The term quality refers to the physical properties as well as the chemical composition of the grain.

There are two kinds of wheat, known as "hard" and "soft" wheat. A hard wheat is one with a horny or flinty texture and is fairly high in protein content. They are usually red in colour, and on chewing a few grains the starch is removed and there remains in the mouth a small pellet of gluten, which is tough and elastic like rubber, but not sticky. Hard wheats, as a result of their high gluten content, make a "strong" flour which is adapted for making

light bread. At first there was much opposition to hard wheats, because of difficulties in milling and baking. However, in recent years this opposition has been overcome to a very great extent.

A soft wheat is more easily crushed than a hard wheat; it has a starchy or dull appearance, and is relatively rich in starch. The colour may be either red or white; the very little gluten can be separated from it by chewing, and that little is much less tough and elastic than the gluten of a strong wheat. The soft wheats have been regarded with favour for the making of bread and pastry flour; however, the flour from soft wheats is said to be "weak," that is, incapable of making a large heavy loaf.

The strength of wheat is determined by the size, shape, texture and general appearance of the loaf. For instance, a weak wheat makes a small flat loaf, whereas a really strong wheat makes a large well-risen loaf of uniformly porous texture. We therefore may define the strength of wheat as the capacity for making bread which suits the public taste of the present day.

Most Rhodesian wheats come into the class of soft wheats, and are considered by the millers and bakers to be of poor quality for the making of bread, etc., when compared with Canadian wheat or good wheats of any other country.

In England the home-grown wheats nearly all come under the class of soft wheats, but the Home-Grown Wheat Committee of the National Association of British and Irish Millers collected strong wheats from every country where they are produced and grew them in England, and from a strong variety of Canadian wheat was isolated a variety known as Red Fife; this variety when grown in England was found to produce wheat as strong as the best Canadian. It has been grown continuously for a period of twenty years and is still producing a wheat which when ground and baked possesses a strength equal to the best Canadian wheat.

Working along the same lines as in England, there seems to be no reason why a variety should not be produced in this Colony which will pass all milling and baking tests. It is, of course, necessary to make very careful crosses and selec-

FIG. 7


FIG. 8

FIG. 9.

Fig. 7.—Typical ears of a few of the many cultivated varieties of wheat.
Fig. 8.—Ears of different types of wheat : 1, Polish ; 2, Club ; 3, Bread ; 4, Poulard ; 5, Durum ; 6, Spelt ; 7, Emmer ; 8, Einkorn.
Fig. 9.—Showing how two wheats are crossed ; segregated into different types in the second generation. P P are the two parents ; F1 is the cross from P P ; F2 (1-6) are types found in the second generation.
(From T. B. Wood, "Story of a Loaf of Bread.")

tions and first to test them out in plots for yield, rust resistance, etc., and when they have passed the experimental stage, to issue them to growers to be tried on a field scale.

It is well to mention that wheat is not only one of the most adaptable of plants, but it is also one of the most plastic and prone to variation. During the many centuries over which it has been cultivated it has yielded hundreds of different varieties. It is impossible to say which is the best; a variety of wheat growing well, say, in Canada, will most probably go under in this Colony, so it is very essential to breed up a variety suited to local conditions.

(*To be concluded.*)

## Agricultural Shows.

Umtali.—28th and 29th June.

Gatooma.—2nd and 3rd August.

Bulawayo.—6th, 7th and 8th August.

Gwelo.—15th and 16th August.

Salisbury.—21st and 22nd August.

# Farm Forest Practice in Southern Rhodesia.

*Issued by the Forest Service.*

## III. SOWING, PLANTING AND CHOICE OF SPECIES.

In a previous article the raising and care of young trees up to the time they were ready for planting into their permanent sites were described.

Before considering the various methods adopted in setting out planting stock, the question of sowing seed direct into the field must first be discussed.

**Direct Sowing.**—The general tree planter over the major portion of the Colony has so far instinctively avoided attempting to raise plantations by the sowing of seed *in situ*. Adverse climatic conditions, the unreliability of the seasonal rains, and the fact that the trees most commonly grown are small-seeded, are the factors upon which this sound reasoning is based.

In the higher rainfall areas of the Colony, for instance on the eastern border, this method of establishing trees has nevertheless met with great success. Hitherto, however, it has not been extensively used, by reason of the fact that ready supplies of good cheap seed have not been available.

The main requirement for successful *in situ* sowing is constant moisture during, and for a few weeks after, the germinating period. It follows that the greater the size of the seed sown, or, in other words, the greater the reserve supply of food in the seed, the greater will be the chances of the young plant in tiding over short periods of drought. A plentiful supply of organic matter in the soil, protection by overhead shade, or any other aids to water conservation all further the chances of successful germination.

Either broadcast-, strip- or spot-sowing may be carried out, but the first method is not advocated unless the cost of seed is of no consequence. Furthermore, the question of the labour involved in thinning out the greater portion of the established plants must be considered.

"Strip-sowing," as the name implies, confines the sowing to prepared strips which are a given distance apart from each other. It is a modification of broadcast-sowing in that the seed is sown haphazard in the strips.

"Spot-sowing" is carried out by placing a few seeds in spots which have previously been marked out a certain distance apart. The amount of seed per acre is, of course, much reduced by this method, as is also the cost of preparation if tillage is confined to patches.

There can be no hard and fast rule as to the amount of seed to sow per acre. The quantity available and the germinating capacity of the seed must be taken into consideration. Under ordinary conditions three to five seeds per spot, in the case of spot-sowing, should give successful results.

It is important to bear in mind that a good tilth for the seed bed is necessary. This will be readily understood when it is considered that tilth is essential in a nursery where young plants have always an assured supply of water.

Seed sown in strips or spots should be lightly covered—to the depth of the seed—in order to facilitate germination and as a protection against marauding birds or insects.

**Planting Distance.**—The previous article described the manner of marking the sites where plants are to be set out. It has been found in this Colony that a planting distance of 6 feet by 6 feet is the most economical and serviceable. This espacement ensures, under normal conditions, the formation of canopy at an early age in the life of the wood. It prevents the formation of heavily branched trees, the timber of which would not be of first quality, and it gives a reasonable margin in allowing for failures and still having a well-stocked stand of established trees. Some slow-growing trees, or trees which have a pyramidal habit of growth, may even be planted 5 feet by 5 feet. Good examples of these trees are the

*Callitris calcarata* and *Call. robusta*, which, in the Savannah zones, do not ordinarily form canopy until the fifth year from planting.

The approximate number of plants required per acre may be estimated by dividing the number of square feet in an acre by the square of the planting distance. In the case of rectangular, but not square, planting, the number required is obtained by dividing the number of square feet in an acre by the product of the distance in the rows and the distance between the rows. Thus the number of plants per acre in a 6 feet by 6 feet plantation would be—

$$\frac{43,560}{6 \times 6} = 1,210 \text{ plants}$$

and in a 5 feet by 6 feet plantation—

$$\frac{43,560}{5 \times 6} = 1,452 \text{ plants.}$$

**Period for Planting.**—In theory planting may be carried out at any time of the year. In practice, however, the planting period in this Colony is confined to the rainy season. The hard experience of many disappointments has shown that in the Savannah zones, i.e., the regions west of the high eastern border, planting should be left over to the latter half of the rainy season, for two main reasons, viz.:—

(i.) The rains in October, November and December are often extremely unreliable and are generally characterised by thunderstorms and short heavy downpours. Following on the long dry season, the soil is usually so baked that intense evaporation and run-off allow very little moisture to soak into the ground. In consequence, trees planted during favourable weather in these three months have only surface water upon which to draw. This encourages a surface root system. The intra-seasonal droughts, which are common, effect an almost complete drying out of the surface layers of soil, with the result that the young plants are caught high and dry, and, if they do not actually succumb, they are so weakened that they fall an easy prey to disease and that ubiquitous scavenger, the termite or "white ant."

As a contrast with this the rains of January, February and March have a steadier and more persistent fall. The

cloudy weather retards evaporation, and run-off is appreciably lessened, with the result that conditions favour the soaking of water into the soil and sub-soil. Young trees planted in such soil have therefore every inducement to develop a strong taproot. When the rains cease and the water table sinks, there is no longer mere inducement to the roots, but actual stern compulsion to follow the sinking water table if life is to be maintained.

(ii.) During the first half of the rainy season the growth of grass and various weeds is particularly vigorous, and unless this is kept in check, often at great expense, the competition with which young trees are called upon to contend is severe and exacting. By the end of January, however, the weed growth has relaxed considerably in vigour, with the result that more food and moisture become available to the recently set out plants.

A consideration of the foregoing will show that planting over the larger portions of the Colony should be confined to the latter part of January, to February and March, and even in years of good rainfall, early April.

**Planting Weather.**—Planting is most successfully carried out on dull, windless and drizzly days, and preferably in late afternoon. Sun and wind produce a less humid atmosphere, which necessitates the exercise of more than ordinary caution in limiting the exposure of the roots of plants to the shortest possible time.

**Size and Shape of Plants.**—In ordinary forest practice in this Colony plants should be set out when they are 3 to 6 ins. high. The root system should be well balanced in relation to the rest of the plant, and should be well supplied with small fibrous roots. Taproots of undue length should be nipped off to a reasonable length as well as abnormally developed lateral roots. Plants with badly bent taproots (usually the result of bad pricking out) should be thrown away, as sooner or later they will fail in the field.

The smaller the plant set out, say, down to 3 inches, the greater are the chances of success in that there is a smaller root system to disturb and less shock from which to recover when the roots are struggling to establish themselves in their new environment.

It often happens, when favourable planting weather is long delayed, that eucalypts and other fast-growing, broad-leaved trees have reached an alarming size by the time planting is possible. In such cases it is usually advisable to cut back the plants to leave about 6 inches of stem, which may have a few or no leaves remaining. Immediately before actual planting the root systems should be correspondingly shortened.

When suckers, e.g., of poplar or bamboo, are set out, the same operation of cutting back should previously be carried out.

**Planting Methods.**—(a) *With Balls of Earth.*—The most common practice in this Colony is to use plants which have previously been pricked out into tins or trays, usually 25 to 30 in a tin.

The tins should be carried to the planting site and well watered. As each tin is to be used, it will facilitate removal of the plants if a sharp knife is drawn between the rows both across and along the tin. The knife should pierce the soil to the bottom of the tin and also sever the interlacing roots. In this manner each plant stands by itself in a cube of earth. After the removal of the first cube—in any corner of the tin—the remaining plants are easily removed in succession.

A hole is made in the planting site—by means of a hoe, trowel or flat pointed stick—slightly larger than is sufficient to receive the ball of earth containing the plant. In removing the ball of earth a rapid examination for a bad root system should be made, and care should be taken that the earth is not squeezed tightly round the roots.

The ball of earth is held firmly against one side of the hole, so that the base of the stem is on a level with the top of the hole. Mother earth is then firmly tamped all round the ball of earth, so that absolute contact is assured. No air spaces must be left, especially at the bottom of the hole. The soil is then firmed down by pressure of the feet, care being taken that no soil is piled above the collar of the plant. If practicable, a little water should be given to the plant to settle it in the soil.

If the ball of earth becomes detached from the roots, the method for open-rooted plants should be followed.

(b) *Open-rooted Plants—Without Balls of Earth.*—The setting out of open-rooted plants is carried out in the case of seedlings which are removed direct from the nursery beds, when no pricking out has been done, or in the case of transplants from transplant beds, when the cost of transport to the planting site is a big consideration.

The seedlings or transplants are removed from the beds with a fork or spade in such a manner that the minimum of damage is done to the roots. The plants are packed in a tin containing a sloppy mixture of dung and mud, or sometimes —though this is not advisable in the Savannah zones—in wet sacks or bags containing some moist moss or other vegetable matter.

At the planting site a hole is made with a hoe, spade or trowel, slightly deeper than the length of the root system of the plant. The plant is removed from the tin or sack and placed well into the hole. Earth is placed on the bottom of the root and the plant is then gradually drawn up until the collar is on the level with the top of the hole.

During this operation, which ensures the straightening out of the roots and the natural spreading of the whole system, earth is tamped round the roots until the hole is filled. If care is taken to start tamping at the bottom of the hole there need be no fear of leaving air spaces to which the roots might be exposed. The soil is firmed and watered as in the method for balled plants.

A quicker method of planting is with the dibbling stick, which is pointed, and of square, triangular or circular section. The soil is pierced with the stick and the plant inserted into the resulting hole in such a manner that the taproot is not bent. While the plant is being held in position the stick is pierced obliquely into the soil a few inches from the first hole. By applying pressure to bring the stick into a vertical position, soil is pressed against the plant and the operation is complete. The disadvantage of this method is that there is no certainty that no air spaces are left at the bottom of the first hole. Many failures are accounted for in this way, especially when raw labour gangs are used in planting operations.

Various methods of planting by "notching" are sometimes used, especially in soils whose texture will allow of a clean cut. "T-notching" is the most common and is carried out by means of a spade. The spade is inserted into the soil to a depth commensurate with the length of the root of the plant. At one end of the notch or slit so formed the spade is again inserted at right angles. The spade is then tilted back, with the result that the first notch opens out. The plant is then placed in the gap, and the spade withdrawn. The earth will tend to subside into its original position, but assistance should be given by pressure of the feet to ensure that no air spaces are left.

In the Savannah zones the dibbling and notching methods are not advocated. Skill and understanding are needed in carrying out the operations. In any case the roots assume an unnatural position in the soil, and in a country where tree planting is fraught with numerous pitfalls, any method which is inimical to the formation of a normal root system should be avoided.

All methods of setting out open-rooted plants are subject to appreciable failures, namely, by reason of the fact that roots are more liable to exposure to the air than when balled plants are used. Unless, therefore, keen supervision of planting is exercised, it may well be that the initial low cost of such operations will, by reason of repeated subsequent filling of blanks, eventually approximate the expense which would have been incurred by planting with balls of earth.

**Choice of Species.**—The preceding article laid stress on the fact that where trees are to be grown for timber purposes, adequate moisture and depth of soil are essential. Furnished with these primary requirements, nearly all the trees recommended hereafter will grow. Nevertheless, climatic conditions and elevation will eventually be the limiting factors in determining the choice of species most suited to the locality. The scope of this article renders it impossible to detail the species of exotic trees most suited to each district of the Colony. A broad classification on a rainfall and altitude basis is therefore suggested as follows:—

(a) *Rainfall, up to* 35 *inches; Altitude,* 3,000 *to* 5,000 *feet.*—

| Broad-leaved trees—Hard Woods. | Conifers—Soft Woods. |
|---|---|
| Eucalyptus rostrata | Cupressus sempervirens |
| ,, tereticornis | ,, torulosa |
| ,, punctata | ,, arizonica |
| ,, saligna | Callitris calcarata |
| ,, botryoides | ,, robusta |
| ,, citriodora | Pinus insignis |
| ,, maculata | ,, canariensis |
| ,, paniculata | ,, longifolia |
| ,, maideni | ,, halepensis |
| ,, resinifera | |
| ,, crebra | |
| ,, sideroxylon | |
| Cedrela toona | |
| Jacaranda mimosæfolia | |
| Melia azederach | |
| Populus alba (soft timber), near streams | |
| ,, deltoidea (soft timber), near streams | |
| Salix babylonica (soft timber), near streams | |

(b) *Rainfall*, 35 *inches and over; Altitude*, 5,000 *feet and over.*—

| Hard Woods. | Soft Woods. |
|---|---|
| Eucalyptus saligna | Cupressus sempervirens |
| ,, botryoides | ,, lusitanica |
| ,, microcorys | ,, torulosa |
| ,, resinifera | ,, macrocarpa |
| ,, maideni | Pinus insignis |
| ,, globulus | ,, patula |
| ,, paniculata | ,, longifolia |
| ,, maculata | ,, canariensis |
| ,, pilularis | ,, pinaster |
| Cedrela toona | ,, tæda |
| Grevillea robusta | Callitris whytei |
| Populus alba | Cryptomeria japonica |
| ,, deltoidea | Cedrus deodara |
| Salix babylonica | Araucaria braziliensis |
| | ,, excelsa |

*In situ* sowing of all the soft woods above-mentioned and of *Eucalyptus citriodora*, *E. maculata*, *Melia azederach* and *Cedrela toona* may be undertaken. Successful establishment over large areas can, however, only be contemplated in the (b) zone.

The trees recommended may be grown both for timber and ornamental purposes.

# Salisbury Agricultural Experiment Station.

## ANNUAL REPORT, 1927-28.

By H. C. Arnold, Station Manager.

A total rainfall of 26.63 inches was recorded at this station during the season under review, this amount being 5.5 inches less than the average annual precipitation and 4 inches more than that of the previous year. In spite of a heavier total rainfall, more days on which rain fell and heavier falls of rain, the season 1927-28 proved less favourable to the maize crop than the previous one. This was probably due to a prolonged period of drought which occurred at the time the maize crop was flowering and which seems to be a very critical stage in the development of the crop.

*Analysis of Rainfall, Season 1927-28.*

| Month. | No. of rain days. | Total for month, in inches. | No. of rains over ½ inch. | Total to end of month. | Periods exceeding 1 week without rain. |
|---|---|---|---|---|---|
| October ... ... | 7 | 2.60 | 4 | 2.60 | |
| November ... | 12 | 3.02 | 5 | 5.62 | 4th to 12th Nov. |
| December ... | 14 | 4.89 | 5 | 10.51 | 19th to 27th Dec. |
| January ... ... | 19 | 7.99 | 10 | 18.50 | Nil. |
| February ... ... | 5 | 4.11 | 4 | 22.61 | 12th Feb. to 3rd Mar. |
| March ... ... | 11 | 3.48 | 7 | 26.09 | 21st to 28th Mar. |
| April ... ... ... | 5 | .54 | 1 | 26.63 | |
| Totals | | | | | |
| 1927-28 ... ... | 73 | 26.63 | 36 | | 4 periods of 7 days or over. |
| 1926-27 ... ... | 54 | 22.39 | 26 | | 5 periods of 7 days or over. |

This report is drawn up on similar lines to those of previous years (which are still obtainable in bulletin form), and is a summary of the results of the more important experiments in progress. The larger plots are generally duplicated, others are triplicated and often quadruplicated in order that the conclusions drawn may be more reliable. The means of all replicated plots are given in the report. Having served their purpose, a number of experiments have been discontinued, namely:—

(1) Maize and velvet bean sown together for grain.

(2) Maize following various other crops.

(3) *Ricinus* spp. (castor oil beans).

(4) Chilli variety trials.

(5) Adlay varieties.

New experiments commenced this season include:—

(1) Fertiliser trials with ground nuts.

(2) The relative hay values of our principal annual leguminous crops.

(3) The influence of (a) farmyard manure and (b) phosphatic fertilisers on the seed production of dolichos beans.

A series of plots were cropped with maize to determine their inherent fertility prior to the commencement during the following season of "Method of application of fertiliser trials," when fertiliser will be applied in four different ways, namely: (a) Broadcast on surface before ploughing; (b) broadcast on surface and harrowed in a few days before sowing the seed; (c) applied in drills at sowing time; (d) applied in hills with the seed at time of sowing.

## CROP ROTATION EXPERIMENTS: FIRST SERIES, 1913-28.

*Maize Yields in Bags per Acre.*

| System of cropping. | 1927-28. Rainfall, 26.63 inches. | 1926-27. Rainfall, 22.39 inches. | 1925-26. Rainfall, 33.08 inches. | 1924-25. Rainfall, 52.28 inches. | 1923-24. Rainfall, 16.32 inches. | Average yields. |
|---|---|---|---|---|---|---|
| A. Maize continuous, 15 years without manure or fertiliser | 1.9 | 5.25 | 7.8 | 2.3 | 4.2 | 5.92 (14 years) |
| B. Alternate maize and bare summer-fallow, no manure or fertiliser ... | 8.15 | 10.2 | 16.3 | 2.05 | 12.8 | 11.29 (13 years) |
| C. Three-course rotation, maize, velvet beans (reaped), oats. No manure or fertiliser ... | 12.15 | 16.9 | 15.5 | 19.45 | 12.5 | 15.49 (12 years) |
| D. Four-course rotation, maize plus 6 tons dung per acre, oats, velvet beans (reaped), maize ... | | | | | one plot maize only | 19.0 (11 years) |
| Average of two maize plots ... | 17.45 | 22.45 | 24.8 | 22.9 | 11.3 | |

From the returns tabulated above it will be seen that the results for the season under review corroborate those of previous years. Owing to the long drought, the yield from each of the various systems is lower than that of several previous seasons, but whereas the plot which has grown maize continuously for fifteen years returned 1.9 bags per acre or 32 per cent. only of its average yield, the land on which a three-course rotational system has been practised yielded more than six times as much or 72 per cent. of its average yield. Seeing that no fertiliser has been applied in either case, the difference in yield can only be attributed to the different treatment. In System "D," where rotational cropping is supplemented by a dressing of six tons of farmyard manure every fourth year, the results are equally striking. The yield is nine times as much as that in System "A," or 91 per cent. of the average yield of this plot for the past eleven years.

In order that the significance of these results may be considered from another angle, let it be assumed that

Plate No. 1.—Maize continuously for 15 years. Yield 1927-28 1.9 bags per acre. Agricultural Experiment Station, Salisbury.

Plate No. 2.—Maize on the three-course rotation. Yield 1927-28 8.15 bags per acre. Agricultural Experiment Station, Salisbury.

Plate No. 3.—Maize on the four-course rotation. Yield 1927-28 (average of two plots) 17.4 bags per acre. Agricultural Experiment Station, Salisbury.

neighbouring farmers each have a thousand acres of arable land and have cropped it after the manner of the various systems described, and that up to the time of reaping the crop the cost of production is, in each case, the same, namely, 30s. an acre. The relative merits of the various systems may be gauged by the following tabulation, in which the initial cost of production per bag of maize under the various systems is given:—

| | | From 1,000 acres of arable land. | | | |
|---|---|---|---|---|---|
| System. | Yield 1927-28, bags per acre. | No. of acres under maize. | Total number of bags reaped. | Total "initial production cost" at 30s. per acre. | Cost per bag of maize. |
| A ... ... | 1.90 | 1,000 | 1,900 | £1,500 | 15s. 9d. |
| B* ... ... | 8.15 | 500 | 4,075 | 1,500 | 7s. 4d. |
| C ... ... | 12.15 | 333⅓ | 4,046 | 500 | 2s. 6d. |
| | | | | Add value of farmyard manure at 15s. per acre. | |
| D ... ... | 17.45 | 500 | 8,725 | 1,125 | 2s. 7d. |

* The actual cost of production up to the time of reaping, under System "B," would actually be less than is shown, because only 500 acres would be planted to maize, and the cost of working 500 acres of bare fallow would be less than if this land was cropped. In spite of this, the system is seen to be unprofitable and need not be considered further.

From these comparative costs of production it is seen that Farmer A, who has grown maize only for fifteen consecutive years, is now producing maize at a cost which is too high to allow of it being marketed through the usual channels, and that a bag of maize produced under this system costs six times as much as a bag produced by Farmer C, who has adopted a three-course rotational system of cropping his land. Farmer D has a supply of farmyard manure, and by applying it to 250 acres each year at the rate of six tons per acre, is able to dress the whole of his land once every four years and maintain its fertility. If the manure is valued at 10s. per ton and the cost of six tons is spread over four years, the sum of 15s. is added to the "initial production cost," bringing it to 2s. 7d. per bag. Although Farmer D's maize cost him 1d. per bag more than Farmer C's, the

use of farmyard manure enables him to grow a much larger crop, and he secures a proportionately larger income. In addition to the maize crop, Farmer D obtains heavy crops of oat hay and velvet bean hay which he can feed to his live stock. This rotational system is therefore scientifically balanced because it provides food for live stock, which in turn produces farmyard manure, the application of which to the soil maintains or even increases fertility, so that it is able to produce heavy crops of grain and fodder for an unlimited period of time.

More convincing evidence of the value of and necessity for properly balanced rotational systems of cropping it would be difficult to find. In addition to larger total yields, the crops are better able to withstand the effects of drought or excessive rains than when single-cropping systems are practised. It is evident, therefore, that scientifically balanced rotational cropping systems provide a form of insurance against unfavourable climatic conditions which it is impossible to obtain in any other way.

## ROTATIONAL EXPERIMENTS: SECOND SERIES.

These rotations were commenced in 1919-20 and were designed to meet the needs of farmers who found they could not follow a mixed farming system. The series includes two plots, A and G, on which maize is grown continuously without manure or fertiliser to check the results of the rotational trials.

### *Plot A. System "E."*

Maize continuously without manure or fertiliser.

Seasons and yields of maize.

| 1927-28. | 1926-27. | 1925-26. | 1920-21. | 1919-20. | Average over 9 years. |
|---|---|---|---|---|---|
| 6.5 | 10.6 | 12.0 | 27.2 | 25.5 | 13.20 |

### *Plots B to E. System "F."*

Three-quarters of the land under maize, one-quarter under Sudan grass. Each year one section under maize, commencing with Plot B in 1919-20, receives eight tons of farmyard manure per acre.

| | 1927-28. | 1926-27. | 1925-26. | 1919-20. | Average 1920-28 (7 crops). |
|---|---|---|---|---|---|
| Plot B ... ... | 17.00* | 18.15 | S. | 26.0 | 20.03 |
| Plot C ... ... | 8.5 | S. | 21.5 | 23.7 | 16.40 |
| Plot D ... ... | S. | 16.35 | 24.5* | S. | 19.79 |
| Plot E ... ... | 11.60 | 20.30* | 18.9 | 24.6 | 17.13 |
| Average ... ... | 12.36 | 18.27 | 21.6 | 24.7 | 18.34 |

It will be seen from the tabulation given above that although a dressing of eight tons of farmyard manure every fourth year is not sufficient to maintain the fertility of the soil at its original level, the average yield from the plots in the rotation during the past season was twice as much as that from maize continuous in Plot A and nearly three times as much as that from maize continuous in Plot F below.

*Plot F. System "G."*

Maize continuous. No manure or fertiliser.

Seasons and yields of maize in bags per acre.

| 1927-28. | 1926-27. | 1925-26. | 1920-21. | 1919-20. | Average over 9 years. |
|---|---|---|---|---|---|
| 4.8 | 9.63 | 14.0 | 24.2 | 23.3 | 12.99 |

The yields on this plot are shown to have fallen rapidly during the past few years, and form a very striking contrast to those on the rotational systems in this series.

*Plots G to K. System "H."*.

Three-quarters of the land under maize, one-quarter under velvet beans which are ploughed under for green manure. One section under maize, commencing with Plot G in 1919-20, receives 200 lbs. per acre of fertiliser each year, i.e., each field receives fertiliser once every fourth year, and once every four years is green manured.

* Indicates application of farmyard manure.

| | 1927-28. | 1926-27. | 1925-26. | 1919-20. | Average 1919-27 (7 crops). |
|---|---|---|---|---|---|
| Plot G ... ... | 14.50* | 17.90 | Beans | 23.1* | 16.91 |
| Plot H ... ... | 14.40 | Beans | 13.8 | 23.0 | 17.19 |
| Plot J ... ... | Beans | 14.2 | 15.8* | Beans | 14.92 |
| Plot K ... ... | 7.8 | 14.7* | 20.2 | 19.2 | 15.30 |
| Average ... ... | 12.23 | 15.6 | 16.6 | 21.7 | 16.08 |

The value of humus in the soil is clearly demonstrated by these experiments. In System "H," Plot K yielded 20.2 bags per acre of maize after being green manured in 1924-25. The following year, with the aid of fertiliser, the yield was maintained at the satisfactory level of 14¾ bags; but in spite of some benefit from the residue of the fertiliser, only 7.8 bags were obtained this season, whereas under the same climatic conditions Plot H, which had been green manured the previous season, produced nearly twice that amount. Similarly in System "F" the lowest yield was that of Plot G, which received the periodical dressing of farmyard manure four years previously and was only half of that obtained on the immediately adjoining plot, which received manure during the current season.

The new rotation trials which were commenced last season were continued, but until they have passed through a few more seasons it will not be possible to make reliable deductions from the data collected.

## GREEN MANURING WITH IMMATURE *VERSUS* MATURE CROPS.

These experiments have been in progress since 1923, and the results to date favour the ploughing under of comparatively mature crops. The primary object of this experiment was two-fold, namely, to ascertain whether the ploughing in of two consecutive green crops in the same season would have toxic effects on the land or whether, by adding a greater amount of organic matter, it would be more beneficial than the ploughing under of only one crop.

*Application of fertiliser.

Plate No 4.—The four-course rotation plots. At the extreme left is velvet beans. On the left of the centre of the picture is maize following velvet beans on land which received farmyard manure four years previously. On the right of the centre of the picture is maize on land dressed with six tons per acre of farmyard manure during the current season. At the extreme right is oats, which complete the rotation. The crops in the foreground are not part of the rotation.

In previous experiments it was found that the growing season was too short to permit of two velvet bean crops reaching moderate maturity, and they were therefore turned under before reaching the podding stage. During the season under review, Sunn hemp has been grown instead of velvet beans, but although the first crop of Sunn hemp was sown before the commencement of the rains, it was still very immature when ploughed under in January to allow of the second crop being sown. The returns show that the two immature crops combined weighed less than the single mature crop.

Below is given the weight of green material ploughed under in each case:—

| Treatment. | Date of sowing. | Date of ploughing under. | Weight of green material. Lbs. per acre. Plot 1. | Plot 2. | Average of two plots. Lbs. per acre. |
|---|---|---|---|---|---|
| 1 mature crop ploughed in when first seed pods well developed ... | 2nd Nov., 1927 | 25th Feb., 1928 | 10,500 | 9,800 | 10,150 |
| 2 crops ploughed under— | | | | | |
| First crop, at appearance of first flowers | 2nd Nov., 1927 | 12th Jan., 1928 | 2,800 | 2,900 | 2,850 |
| Second crop, when flowers open ... | 17th Jan., 1928 | 10th April, 1928 | 3,900 | 3,300 | 3,600 |
| Total, 2 immature crops | | | 6,700 | 6,200 | 6,450 |

Previous years' results of these trials gave rise to the question of whether immature crops will benefit the land as much as crops which have become fully grown before being ploughed under.

In continuance of these trials, Sunn hemp and velvet beans were sown on 2nd November, 1927, and one-half of each plot was ploughed under as soon as flower buds were well formed. The remaining half was turned under six weeks later. The amount of green material ploughed under in each case was as follows:—

| | Date first crop ploughed under. | Amount of green material. Lbs. | Date mature crop ploughed under. | Amount of green material. Lbs. |
|---|---|---|---|---|
| Sunn hemp ... | 15.1.28 | 3,200 | 28.2.28 | 12,550 |
| Velvet beans ... | 9.2.28 | 7,743 | 28.3.28 | 15,000 |

## MAIZE CHECK-ROWED *VERSUS* DRILLED.

This season's results in these experiments confirm those of previous years. From the table given below it will be seen that the "drilled" plots gave a slightly heavier yield than those on which the plants were check-rowed. This was probably due to the more even distribution of the plants over the surface of the land, so that they were better able to make use of the limited supply of moisture in the soil. Over the four-year period that these experiments have been in progress they have shown that in yield alone there is no advantage to be gained from check-rowing, but that slightly higher yields are obtained when the crop is drilled. In field practice, however, and particularly on weed-infested land, check-rowing may be found advantageous because it allows machinery to be more freely used in the cultivation of the crop, so that the small reduction in yield due to check-rowing may be more than balanced by the increase in yield resulting from having the land freer from weeds, and this without resort to costly hand cultivation.

*Yields of Maize in Bags per Acre.*

| Method of planting. | 1927-28. Rainfall, 26.63 inches. | 1926-27. Rainfall, 22.39 inches. | 1925-26. Rainfall, 33.08 inches. | 1924-25. Rainfall, 52.28 inches. | Average over 4 years. |
|---|---|---|---|---|---|
| (1) Drilled 36 in. x 18 in., one plant to each hill; 9,680 plants per acre | 21.18 | 21.00 | 17.33 | 21.3 | 20.20 |
| (2) Two plants to each hill, 36 in. x 36 in. apart; 9,680 plants per acre | 19.26 | 21.00 | 17.05 | 18.6 | 18.98 |
| (3) Three plants to each hill, 42 in. x 42 in. apart; 10,688 plants per acre | 20.22 | 20.30 | 12.67 | 14.9 | 17.02 |

The reduced yield when three plants are left to the "hill" is worthy of note; this reduction in yield has also been observed over many large fields of check-rowed maize.

## MAIZE: DISTANCE-PLANTING TRIALS FOR GRAIN.

*Yields of Maize in Bags per Acre.*

| | Number of plants per acre. | 1927-28. Rainfall, 26.63 inches. | 1926-27. Rainfall, 22.39 inches. | 1925-26. Rainfall, 33.08 inches. | 1924-25. Rainfall, 52.28 inches. | Average over 4 years. |
|---|---|---|---|---|---|---|
| 24 x 15 in. | 17,424 | 12.28 | 17.0 | 12.4 | 23.1 | 15.82 |
| 24 x 18 in. | 14,520 | 15.50 | 17.36 | 14.2 | 19.7 | 16.89 |
| 30 x 15 in. | 13,939 | 15.00 | 19.53 | 17.5 | 23.1 | 18.40 |
| 30 x 18 in. | 11,616 | 16.24 | 19.13 | 18.2 | 20.4 | 18.41 |
| 36 x 15 in. | 11,616 | 16.16 | 18.24 | 18.5 | 20.1 | 17.72 |
| 36 x 18 in. | 9,680 | 17.08 | 18.69 | 17.5 | 20.3 | 18.28 |
| 40 x 15 in. | 10,454 | 15.44 | 16.68 | 16.6 | 17.0 | 16.37 |
| 40 x 18 in. | 8,712 | 15.60 | 16.56 | 16.2 | 17.2 | 16.32 |

*Yields of Closely Planted Rows* versus *Widely Spread Rows.*

| Average of four methods. | Three seasons, 1925-27. Bags per acre. | 1927-28. Bags per acre. | Decrease. |
|---|---|---|---|
| Rows 24 in. to 30 in. apart ... ... ... ... | 18.47 | 14.76 | 3.71 |
| Rows 36 in. to 40 in. apart ... ... ... ... | 17.80 | 16.07 | 1.73 |

That this year's yields favour the wide spacing is shown by the tabulations given above. This is to be expected, because, owing to the lack of rain, the smaller number of plants on a given area were able to develop better than the larger number on an equal area. The second tabulation shows that the average yield this season of the plots on which the rows were spaced 24 in. to 30 in. apart is less than the average yield for the three previous seasons by 3¾ bags per acre, whereas that of the more widely spaced plots has decreased by 1¾ bags per acre only. There is, therefore, a yield of 2 bags per acre in favour of the more widely spaced rows this season. The average yield over four seasons is seen to vary little for the distances 30 in. x 15 in. to 36 in. x 18 in., but as the wider spacing between the rows allows the operations of sowing and weeding to be executed at a lower cost, the distance of 36 inches between the rows would seem to be the most economical for field practice on land of average fertility.

## MAIZE VARIETY TRIALS.

These experiments have been in progress for a period of ten years, during which all the standard breeds of maize have been tested and a number of new kinds have been introduced from time to time. With very few exceptions the new varieties have proved more susceptible to disease, and their yields have been smaller than those of the standard kinds.

*Yields of Shelled Grain in Bags per Acre.*

| | Previous averages. | 1927-28. | 1926-27. | 1925-26. | 1924-25. | Average. |
|---|---|---|---|---|---|---|
| Salisbury White ... | 13.1 (6 years) | 18.96 | 18.12 | 17.2 | 16.5 | 14.93 (10 years) |
| Potchefstroom Pearl ... | 13.1 (6 years) | 19.20 | 17.28 | 17.1 | 16.5 | 14.87 (10 years) |
| Louisiana Hickory ... | 13.0 (4 years) | 19.14 | 14.03 | 15.6 | 18.8 | 14.94 (8 years) |
| Hickory King | 12.5 (6 years) | 17.40 | 17.97 | 11.6 | 19.5 | 14.14 (10 years) |
| American White Flint | — | 14.00 | 10.2 | 15.3 | — | — |
| Cocke's Prolific ... | — | 14.16 | 12.81 | — | — | — |

These trials show that all the varieties most commonly grown in this Colony are of equal merit for grain production when they are grown side by side on soil of average fertility. The American White Flint yields from two to four bags per acre less than the other kinds at this station, but in districts of low rainfall or early frosts it might prove to be the more profitable kind to grow because of its drought-resistant and early maturing characteristics.

## MAIZE FOLLOWING GREEN MANURE CROPS SOWN UNDER MAIZE DURING THE PREVIOUS SUMMER.

Experiments previously reported upon have shown that on this station the practice of sowing green manure crops under maize at the last cultivation, to be ploughed under before the next sowing season, cannot be relied on to give profitable results, because success is so largely dependent on

the amount of rain which falls during February and March. If the rainfall during these months is less than the normal amount, either the maize crop is reduced through competition with the green manure crop or the crop intended for green manuring fails to grow. The practice may be successful when the stand of maize has become considerably reduced, and under such circumstances only is this method of green manuring likely to be found reliable or profitable.

As a variation of these trials, one-half of the series of green manure crops which were sown under the maize on 23rd January, 1925, was allowed to continue its growth during the following summer, and was ploughed under during March, 1926, by which time the various crops had attained their maximum growth. Thus on the green manured areas no maize crop was grown during the season 1925-26, but on the control plot a crop of maize was secured. The results over the four-year period 1924 to 1928 are shown in the following table:—

*Yields of Maize in Bags per Acre.*

| Green manure crop sown under maize 23.1.25 | 1924-25. Rainfall 52.28 | 1925-26. Rainfall 33.08 | 1926-27. Rainfall 22.39 | 1927-28. Rainfall 26.63 | Total yield of maize in 4 years |
|---|---|---|---|---|---|
| Dhal ... ... | 4.30 | Green manure | 18.30 | 9.7 | 32.30 |
| Khaki Jack Bean | 5.05 | Green manure | 16.90 | 7.9 | 29.85 |
| White Jack Bean | 5.50 | Green manure | 16.80 | 6.9 | 29.20 |
| Control (maize only) | 6.15 | 7.70 | 10 60 | 2.6 | 27.05 |

These returns show that in the season 1924-25 there was a slightly lower yield of maize on the plots which were undersown with green manure crops than on the plot which carried maize only, due apparently to the influence of the green manure crop, but the yields obtained in subsequent years more than balanced the loss. The tabulation shows that whereas the total yield over the four-year period 1924-28 on the plot which carried maize every year was 27.05 bags per acre, the yield of three crops only during the same period on the green manured plots averaged 30.45 bags per acre—an increase of 3.4 bags. Moreover, the land which was green manured is still in a higher state of fertility than the control plot, so the beneficial effect of the green manuring is not fully revealed by these returns.

Two advantages of this system over the usual practice of sowing the green manuring crop in the beginning of the season are (a) the trouble and expense of preparing a seed bed are avoided, and (b) the work of establishing the green manure crop having been accomplished in the autumn, more attention can be given to the preparation of the seed bed and the other operations connected with more important crops at the beginning of the next season. Unfortunately the success of the method depends very largely on the amount of rain falling during February and March, and to some extent on the severity of the frosts. The green manure crops sown in January, 1925, made satisfactory progress owing to late rains, and each year since then dhal has made fairly satisfactory growth, but last year it was killed by frosts. The system cannot, therefore, be unreservedly recommended at present, but these experiments are being continued with a view to finding a crop which is more suited for the purpose.

## THE RELATIVE VALUE OF CROPS FOR GREEN MANURE.

The question is often raised as to which is the best crop for use as a green manure. It is generally accepted that leguminous crops are to be preferred because of their ability to use the free nitrogen of the air for their own requirements, so that when they are ploughed under the land is enriched by the nitrogen they have collected. On the other hand, a non-leguminous plant, because of its greater bulk, may provide a larger amount of humus, and for that reason may prove more suitable.

In these trials our three best known leguminous green manuring crops are being tested, and in the second series a non-legume, Niger oil seed, was included. In a fourth series (sown during the season under review) sunflower is being tried in place of Niger oil seed, as the latter crop, although an excellent one for green manuring and silage, has not taken on to any great extent in this Colony, and its seed is not, therefore, easily procured. Sunflower is easily grown; it is very drought-resistant; seed is easily obtained; it may be sown either early or late in the season, and because it is a quick grower it appears to be a very suitable green manure crop.

*Yields of Maize in Bags per Acre.*

| Kind of green manure crop | First series acreage of 2 crops 1925-27 | Second series acreage of 2 crops 1926-28 | Third series 1 crop 1927-28 | Average of 5 crops |
|---|---|---|---|---|
| Velvet bean ... ... | 15.26 | 21.46 | 12.34 | 17.15 |
| Dolichos bean ... | 13.80 | 20.76 | 18.40 | 17.50 |
| Sunn hemp ... ... | 16.78 | 20.36 | 14.96 | 17.85 |
| Niger oil seed ... | — | 19.48 | — | — |

Judged by yields alone, these experiments indicate that the benefit bestowed by the three leguminous crops is the same in all cases. The second series is being sown to maize again for the third year to determine whether the beneficial effect of the various crops will continue for the same period. The question of which is the better green manure crop is probably one which each individual farmer must decide for himself by actual trial on his own farm.

## MAIZE MANURED WITH FARMYARD MANURE ONLY *VERSUS* FARMYARD MANURE SUPPLEMENTED BY PHOSPHATIC FERTILISER.

The object of these experiments is to determine whether it is more economical to use farmyard manure by itself or to use it in conjunction with phosphatic fertilisers in the production of maize.

The manure used consisted mainly of the unconsumed parts of maize-stover which had been fed to cattle, and tramped by them during the previous winter and early part of the summer. When it had become well soaked by the summer rains and partially decayed, it was piled into a heap and left to mellow. In August it was spread on the land at the rate of eight tons per acre and ploughed in.

The phosphatic fertilisers (a) one part bone meal and two parts superphosphate, (b) superphosphate (19 per cent. $P_2O_5$) were each applied on duplicate plots, and two plots received no fertiliser in addition to the farmyard manure.

*Yields of Maize in Bags per Acre.*

| Treatment | Average of 2 plots 1926-27 | 1927-28 | Total over 2 years | Increase due to phosphatic fertiliser |
|---|---|---|---|---|
| Farmyard manure plus 150 lbs. per acre bone and superphosphate | 18.52 | 9.47 | 27.99 | 2.25 |
| Farmyard manure plus 150 lbs. per acre superphosphate ... ... ... | 17.53 | 11.59 | 29.12 | 3.38 |
| Farmyard manure only ... ... ... | 16.56 | 9.18 | 25.74 | — |

This experiment indicates that, under the above conditions, 150 lbs. per acre of phosphatic fertiliser costing 10s. may be expected to give an increase of two to three bags of maize an acre. The trials are being continued.

(*To be continued.*)

# Mycological Notes.

## BLACKFIRE OF TOBACCO.

By J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.,
Chief Botanist and Mycologist.

The brown spots which appear upon tobacco towards the end of the growing season will to any close observer show a diversity of forms. It is generally thought by the average farmer that these are variations of one and the same disease and they are usually attributed to angular spot. The common appearance of this disease upon bright tobacco is well known to all, being characterised by a dark brown colour, angular shape and narrow yellow margin, the spots usually being confined to limited areas by the veins of the leaf. Other spots, less angular in appearance and with certain other characteristics, are also frequently found, such as frog eye, which usually has a white centre surrounded by a brown border of varying width, approximately circular in shape. Often, however, especially during periods of continued rainfall, the white centre may be entirely absent, and the spot may take on an angular shape due to the threads of the fungus growing unequally in a radial direction.

Another reddish brown spot, which is usually circular or elliptical and is encompassed by a bright yellow area diffusing into the surrounding green, may often be seen situated between the large veins of the leaf. It has not the characteristic yellowish green "halo" of wildfire and only appears late in the season. This can generally be attributed to the action of a fungus, is known as red rust, and is usually associated with over-ripe leaf.

On heavy leaf, particularly where this condition has been brought about in Hickory Pryor tobacco by low topping before

continued rain or by the application of nitrogenous fertilisers just before topping, it is common to find circular dark brown spots appearing in abundance over the surface of the leaf. The spots are usually about one-eighth to one-quarter of an inch in diameter when first they become conspicuous, and have usually a number of concentric rings showing on the dead tissue. Later these spots may coalesce to form large dark brown blotches which are usually angular in shape, being limited by the large veins. Often the veins themselves become discoloured and appear as dark brown streaks upon the leaf. Sometimes a lesion, almost black in colour, varying from half an inch to two inches long, may be seen on the midrib. The tips of these leaves are frequently covered by numerous small angular spots, which if examined closely will be seen to arise on the small veins. The web of the leaf gradually turns a deep yellow and finally brown, i.e., perishes, the dead area gradually extending towards the stem until the whole leaf dies and hangs down. This dark spotting would appear to be the same disease that is known in America as blackfire, and is said to be identical with angular spot, but numerous attempts made in this laboratory to isolate the causal organism of the latter disease, *Bacterium angulatum*, from the circular brown spots with concentric rings have resulted in failure, so that for some time there has been doubt as to the nature of the affection. It has so far been correlated with rapid development of the plant after a period of slow growth induced by drought or dull weather, in addition to the conditions already mentioned. It is therefore, of considerable interest to note the findings of W. D. Valleau in America* in connection with what is apparently the same disease upon heavy tobacco leaf. This author states that:—

"Results of field, isolation and inoculation studies and pot-culture work raise the question as to whether angular leaf spot and blackfire are not two distinct diseases, the former bacterial and the latter physiological, and associated with certain nutritional and seasonal conditions."

Results of pot-cultures show that in soil which is low in available nitrogen spots similar to those of blackfire, i.e., dark brown and zonate, appear following rapid growth

* Valleau, W. D., "Are Blackfire and Angular Spot of Tobacco Identical?" *Phytopathology*, XIX., 1, p. 93, 1929 *(abs.)*.

induced by heavy applications of nitrogenous fertilisers. The disease also develops during the period following topping and suckering, and can be distinguished from true angular spot by the presence of concentric rings or zonations in the black-fire spots. No details are given of weather conditions favouring the disease, but the general description corresponds so closely to the type of spotting which is common in Southern Rhodesia when late rains occur that it is safe to assume the identity of the two affections.

We have here, then, one explanation of the reported development of angular spot in lands which have been planted from seed beds apparently free from the disease. So that before making wholesale condemnations of the measures advocated for the elimination of *Bacterium angulatum* the farmer should make quite certain that the disease which attacks his crop is true angular spot.

The prevention of blackfire will have to be considered in relation to the application of nitrate of soda or other nitrogenous fertilisers, heavy dressings of which are known to be undesirable late in the growing season. Smaller dressings applied as soon as the plants show signs of yellowing, with, if necessary, a further small dressing given at a time suitable to maintain normal growth, might obviate the trouble. Applications of potash appear to be related to control of the disease in America,, as also do heavy dressings of kraal manure. (The latter condition has been noted in Rhodesia.) It is, however, certain that great care should be exercised in adding strong nitrogenous fertilisers to soil bearing a growing crop.

# Fur and Wool-Producing Rabbits.

By Captain EDGAR S. EVERETT, Hovere Farm, Banket.

(*We are indebted to the writer of this article for supplying first-hand information regarding the rearing of fur and wool-producing rabbits in Southern Rhodesia. Very little is known as to the suitability or otherwise of this Colony for rabbits of these types, and the point can only be settled by actual experience such as is now being obtained at Hovere Farm. As regards the all-important question of markets, we would refer readers to the notice prepared by the Imperial Institute and published in the issue of this Journal for November last.*—ED., R.A.J.)

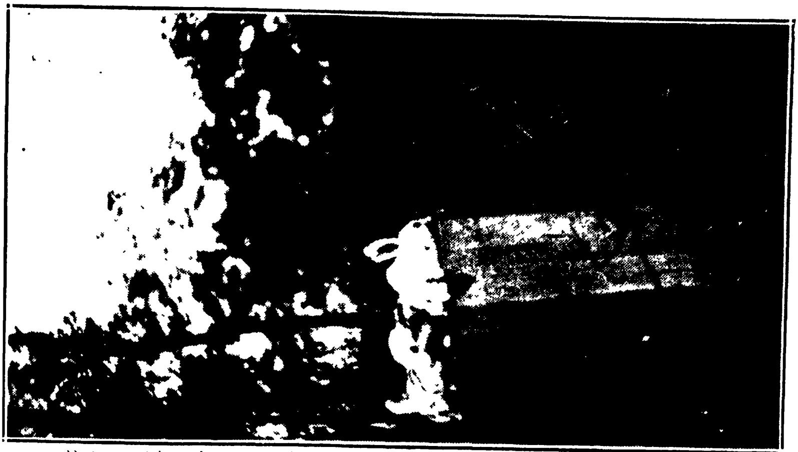
At the present time many farmers are looking for some side-line which will bring in a good return without requiring a large labour staff. The raising of rabbits for fur and wool is an industry that meets with the above requirements.

*Breeds.*—Of the many fur breeds, the Chinchilla is the most popular and numerous, but a comparatively new breed, "the Siamese Sable," is gaining popularity, as it is in great demand with the furriers, being of a dark brown shade.

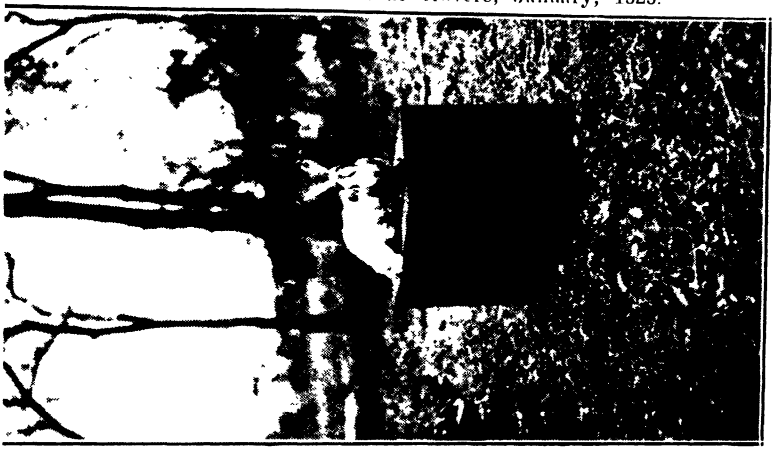
On this farm there are Chinchillas, Angoras and Siamese Sables, the last-named being, we believe, the only specimens of the variety in Africa.

*Fur Rabbits.*—The Chinchillas and Siamese Sables are reared for their pelts. These two breeds are killed at approximately eight months old, skinned and the pelts air cured.

*Wool Rabbits.*—Angoras are the wool producers, and, as they are not killed, but plucked or clipped for their wool, are more suitable for lady fanciers who may dislike having to kill their animals.



Baby Chinchilla rabbits bred at Hovere, January, 1929.



Chinchilla doe, "Grasdale Mary," bred at Hovere, September, 1928.

The new breed.—Siamese sable buck, "Westwood Caesar," recently imported.

*Management.*—It is generally thought that rabbits require considerable attention. This is not so, for the feeding may be done once, twice or thrice daily, the most satisfactory method being twice daily. The times of feeding may be arranged to suit the owners, but regularity and punctuality are important points.

*Establishing Industry in Rhodesia.*—There appears to be a good deal of divergence of opinion regarding the possibility of establishing the rabbit fur and wool industry in this country. To me the whole argument against the possibility appears absurd, for, in view of the fact that no one has "farmed" rabbits during the past in this country, no one is in the position to set up as an authority.

There are, it is true, one or two people who have Angoras and Chinchillas in Rhodesia, but, if I rate the total as 300 head of all fur and wool breeds in this country, I believe I shall not be underestimating. These animals are distributed amongst about a dozen owners, which gives a low average per person, and therefore no one is in the position of speaking authoritatively.

*Outlook.*—In our opinion the raising of rabbits for fur and wool is a most promising industry. The fur markets of the world are finding an increasing difficulty in obtaining pelts for women's coats and for trimmings to clothes. The Angora wool is being strongly recommended by doctors, as the wool makes up into garments of light weight but considerable warmth.

*Outlay and Attention Required.*—The feeding costs for rabbits are very low, and hutches may be made out of boxes by any man handy with tools. The attention required is trivial, for one native can keep a large garden and attend to the cleaning and feeding of a large number of rabbits easily.

*Markets.*—Markets for wool and fur are in England, but when one considers that 34s. per lb. is being paid for wool, and pelts fetch 10s. 6d. each, that both the wool and belts may be packed in small parcels of light weight, which will travel by post at small cost, then the disadvantage of distant markets is slight.

*Clubs.*—A club is now being formed in South Africa through which it will be possible for members to sell their wool and pelts. Anyone anxious to obtain further particulars should communicate direct with E. Carroll, Esq., P.O. Box 192, Germiston, Transvaal.

*Climatic Conditions.*—In Rhodesia the climate appears to be most suitable to the successful raising of rabbits, and animals may be kept out of doors, provided they are shielded from the direct rays of the sun and from rain. The rabbits appear to mature rapidly, and disease, if cleanliness is strictly observed, is a remote possibility.

*Rabbits for Food.*—At present there is no demand for the carcase of the rabbit for food in Rhodesia. However, when the public realise that the flesh is cheap, as well as being delicious to the taste, and is, as the Ministry of Agriculture, England, state, "higher in protein than beef, chicken, pork, veal or mutton," also that "three lbs. of rabbit and one lb. of bacon contain more food than four lbs. of beef," then there may be some demand for the flesh.

*Further Information.*—In closing I would like to say that anyone desirous of obtaining further information on certain points may write to me, but owing to the large number of letters I receive on the subject I find it necessary to point out that if the information they seek is worth anything at all, it is worth a stamped and addressed envelope for the reply.

# The Poultry Industry.

## HINTS TO BREEDERS—REARING YOUNG STOCK.

By A. LITTLE, Poultry Expert.

Many young birds are stunted and weedy. The two chief contributing causes for this condition are lack of sufficient food and the mixing of chicks of different sizes together. A chick from the time it is 36 hours old to maturity, *must* have all the food it will eat. Many poultry keepers do not seem to realise the needs of a growing fowl, and that the food it eats has to supply nourishment to produce feathers (of which it has three crops before reaching maturity), bone, muscle, blood tissue, etc.; also to supply energy, and make up for wear and tear expended in its very active existence. Obviously a chick, unless it receives all it can eat, suffers. It cannot possibly develop into even the semblance of a fully-grown properly-developed bird. It must, too, not only have as much food as it will eat, but the food must be of good quality, and of the right kind for its different needs. For instance, to give only mealies means the production chiefly of fat and heat, and to give only meat means the production chiefly of flesh. The foods must be balanced, and above all they must be in sufficient quantity. I frequently hear such remarks as "Chickens eat such a lot of food," "It costs such a lot to feed them." The obvious answer to these is, hatch and rear *only* the number that can be fed and reared properly. The chief object seems to be large numbers rather than few and good. It is a fatal mistake and one that is most difficult to impress upon poultry keepers.

It is of the greatest importance that there should be no lack of sufficient green food; of this they should have as much as they will eat. On remarking that the chicks are not

receiving sufficient, the usual answer is, "I have no water to grow it," or "It is too expensive to buy." The remedy is to hatch according to the green food supply that can be grown or afforded. It is pure waste of money, time and labour to hatch more chicks than the supply of green food likely to be available.

As stated, another cause for the numerous poor half-starved weedy chicks is the mixing of small and large together. As near as possible, chicks of the same size should run together, otherwise the small ones are chivvied and bullied, crowded at night, and are never allowed to get their proper share of food by the larger ones, with the result that they never grow out, and might as well never have been hatched at all.

A further cause (and unfortunately a common one) for weedy stunted chicks is the uncleanliness of their surroundings and quarters, and their infestation with lice and other insects. Dirty drinking water is not only a common cause of poor stock, but also of many deaths. Young stock, on the other hand, must not be coddled, but they can never be too well cared for, nor can they be given too much to eat, too much fresh air, nor be kept too clean. *One can safely say that 75 per cent. of the young stock reared in this country do not reach at maturity the size and weight they should.*

Many do not seem to realise the above points, nor that there are two Government Poultry Experts to give them all the advice they wish, by correspondence, verbally or in bulletins, and that they have only to ask for it to obtain all the information they require. It is disheartening to see chickens, adult fowls and their quarters under the conditions that so often prevail; feeding wrong, housing wrong; in fact, often everything wrong, when by application to one of the Poultry Experts conditions could be right from the very start, and the stock be a pleasure to see and profitable. Far too many ask advice of neighbours and others who profess to know something of poultry keeping (and in some cases think themselves experts), but whose ignorance is often colossal, or who have at most only a smattering of knowledge of poultry keeping. I have known some even take advice from their natives! Then when things are in a hopeless muddle the Government

Expert is called in to remedy matters, instead of, as he should have been, to give information and instruction at the commencement.

**Four Most Important Essentials** for successful poultry farming are good housing, good feeding, a good laying strain and cleanliness. All four must go hand in hand; to supply the very best of any three without the fourth is useless. Unless a person is prepared to carry out this combination to the very best of his or her ability, poultry keeping should be left severely alone.

# Agricultural and Stock Prices.

At the moment the general index number of prices paid for agricultural produce is 47 per cent. above the level of the base years 1911-13, a rise of 3 per cent. upon the index number of a year ago. This increase is attributable mainly to the higher prices obtained for fat cattle and sheep, and in a lesser degree to rises in dairy produce, poultry and wool. Cereals and other farm crops, however, are lower as a rule.

Compared with 1911-13, when there were no wages boards, wheat now shows a 32 per cent. increase in price, barley 39, oats 47, fat cattle 38, fat sheep 67, bacon pigs 35, porkers 38, hay 11, potatoes 71, milk 61, butter 51, cheese 73, poultry 49, eggs 46, fruit 83, wool 76, beans and peas 33, vegetables 76, and hops 26.

In the matter of stock feeding stuffs the general level of prices has lately risen 15 points to 54 per cent. above 1911-13. Maize and oil cakes have witnessed the greatest increases, but barley and barley meal are now slightly cheaper than at this period a year ago.

Fertilisers at the moment are 2 per cent. below pre-war levels, and this represents the lowest point reached since 1914. This fall has come about mainly owing to the reduction in the price of nitrate of soda.—(*Live Stock Journal.*)

# Fattening for Beef at the Gwebi Farm.

By H. G. MUNDY, Chief Agriculturist.

An article giving the details and costs of fattening for beef during 1928 on the Gwebi Farm was published in the issue of this Journal for January last. At the time that article was written, certain information regarding the expenses of sending the ten grade Shorthorn bullocks to the United Kingdom for sale was lacking, and in Table "B" reference was made to this. On the costs then ascertainable the profit on these bullocks was only 2s. 2d. per beast. Since then, however, the following rebates have been received:—

| | | | |
|---|---|---|---|
| Refund on railage ... ... ... ... ... | £14 | 2 | 6 |
| "No claim" insurance rebate ... | 1 | 14 | 2 |
| Total ... ... ... ... | £15 | 16 | 8 |

The final results on the fattening and shipping to England of these ten animals are therefore as follows (*vide* Table "B," facing page 32, January Journal):—

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Profit per batch | £1 | 1 | 8 | Profit per beast | £0 | 2 | 2 |
| Add Government bounty, 1s. 4d. per lb. | 12 | 5 | 0 | | 1 | 4 | 6 |
| Rebates as shown above | 15 | 16 | 8 | | 1 | 11 | 8 |
| Total ... ... | £29 | 3 | 4 | Total ... ... | £2 | 18 | 4 |

The increased profit on these ten bullocks brings up the average profit on the whole 65 head fattened from £3 10s. 7d. per beast to £3 15s. 5¼d. per head.

# The Laboratory Diagnosis of Animal Diseases.

## A NOTE TO EMPHASISE SOME POINTS IN THE PREPARATION AND FORWARDING OF SPECIMENS.

By D. A. Lawrence, B.V.Sc., Veterinary Research Officer.

The article entitled "The Laboratory Diagnosis of Animal Diseases," by Ll. E. W. Bevan, M.R.C.V.S., D.V.R., which appeared in the *Rhodesia Agricultural Journal* of May, 1927 (reprinted as Bulletin No. 642), indicates fully how specimens should be prepared and forwarded for diagnosis, but it would appear that it is necessary to emphasise certain points in order that stockowners may be assisted in the diagnosis, and consequently the prevention and treatment of animal diseases.

**Necessity for Early Diagnosis.**—Many cases of sudden deaths in cattle are simply disregarded and no attempt made to diagnose them. It frequently happens, however, that such cases of sudden death continue to occur, and then blood smears are forwarded for examination and the presence of anthrax determined, considerable damage having been already done and the infection disseminated. It is desirable in all infectious diseases to get a correct diagnosis of the first case and thus be able to adopt measures to prevent further infection.

**Preparation of Smears.**—This is described in detail in Bulletin No. 642, but it still frequently happens that smears which are "useless for diagnosis due to faulty preparation" are received. Adherent smears, i.e., smears prepared by pressing a drop of wet blood between two glass slides, are

quite useless. Strict cleanliness must be observed in preparing smears; not only must the glasses be free from dirt or grease, but the material from which the smear is to be made must not be contaminated with such things as hair, grass-seeds or dirt. It is quite evident from the smears received that some people intending to prepare blood smears are quite ready to assume that any fluid which exudes from a cut in the carcase is blood, with the result that many smears are prepared from serum alone. In such cases where only a watery fluid, hardly even tinted red with blood elements, exudes from one cut, it is necessary to cut into some other part of the carcase to obtain suitable blood. Frequently it happens that a cut in the ear of a dead animal fails to yield blood, and one should then attempt to obtain blood from some other region, e.g., the legs or even the tail. As putrefaction occurs more quickly in the blood in the trunk of a carcase, the extremities should be selected for the preparation of blood smears in cases where the carcase is decomposed.

Attention must again be drawn to the fact that full particulars should accompany the smears. Smears should be forwarded in duplicate, especially pus smears, and reasonable care exercised to ensure their reaching the examining officer in good order.

**Anthrax.**—Where anthrax is suspected as being the cause of death the carcase should not be opened, and after blood smears have been prepared, as little blood as possible being allowed to escape from the cut, it should be burned or buried intact. That this point is not observed is evident from the number of spleen smears received in cases of suspected anthrax.

**Quarter Evil.**—Where quarter evil is suspected, smears should be prepared from the fluid of the affected part, as well as from blood and spleen or gland.

**Arsenical Poisoning.**—In cases where arsenical or other poisoning is suspected it is necessary to forward blood and spleen or gland smears, as well as stomach wall and stomach contents.

# What is Aroma?

## A PROBLEM IN TOBACCO CULTIVATION.

The object of tobacco smoking, the Imperial Economic Committee have told us in their report on tobacco, is "to enjoy aroma," and it is a curious fact, they say, that although aroma is obviously of the first commercial importance in regard to tobacco, very little is definitely known about its chemical and biological causes. According to Dr. Garner, the senior physiologist of tobacco and plant nutrition in the United States Department of Agriculture, there is neither agreement in the classification of the aroma constituents in tobacco, nor is it definitely known whether they are to be regarded as resins or true essential oils. Very little progress, he says, has been made in isolating and identifying compounds contributing to aroma.

"For a long time it has been considered," Sir David Chadwick, Secretary of the Imperial Economic Committee, said in an interview with a representative of the *Observer*, "that the aroma of tobacco is dependent almost solely upon environment, in the sense of climate and soil, and that if tobacco is transferred from one country to another, it takes on the aroma of the tobacco more common in that country.

"Can, then, the Empire cultivate a tobacco possessing the aroma desired by smokers?"

"It is being done," Sir David answered. "The Empire is constantly improving the quality of its tobacco and is getting nearer and nearer to the tastes that appear to be acceptable to the majority of the British public. The difficulty with regard to aroma is being largely overcome by experimental work and careful observation.

"Workers in different parts of the Empire are employing different methods. In India, for example, they believe that the chief point about aroma depends upon ageing and curing;

in Rhodesia they are laying stress upon the lightness of the soil in which tobacco is grown; and in Nyasaland, whilst both these factors are recognised, they consider that aroma is very largely a heritable quality, to preserve which the greatest care has to be taken to prevent any cross-fertilisation of seed.

"No doubt environment as well as great care over the purity of the seed is of the first importance; and whilst science has not yet discovered the particular qualities of the leaf with which aroma is associated, the progress that has been made shows that the problem, though illusive, is capable of considerable control.

"It is due to the efforts of planters and of all those scientific workers abroad that Empire-grown tobaccos are becoming each year more and more acceptable to the British public. The experience which these research workers are obtaining has led the Imperial Economic Committee to suggest that it may be advisable as soon as the problems are more defined to arrange a small conference to interchange experience and correlate the main lines of future action."—*Nyasaland Times*, 26th February, 1929.

# Seed for Sale, Gwebi Farm.

Kinvarra Oats ... ... ... ... per 100 lbs. 25s.

Price is f.o.r. Gwebi. Cheques should be made payable to "Gwebi Farm." Orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury.

# Correspondence.

*[No responsibility is accepted by this Journal for the views expressed by correspondents.]*

The Editor,
*Rhodesia Agricultural Journal.*

Sir,

*Mealie Crib.*

Your March issue received to-day speaks of mealie hocks with pig netting. It occurs to me to suggest you alter this to read *one-inch wire netting.* Speaking from experience, I have a hock with stone and cement floor; hardwood poles and wire netting under iron roof. I put two-inch netting round *inside* the roof supports, and also inside No. 8 wire put round with a wire strainer. I found too many cobs were worked through the two-inch mesh, so I put in one-inch, and this stopped our black thieves, although I had the wire cut by thieves.

I am, etc.,

R. W. TWILLEY.

Hunter's Road.

# Notes from the "Gazette."

| "*Gazette*" *Date.* | *Items.* |
|---|---|
| 1.3.29. | The importation of all animals from the Colony of Ceylon is prohibited. (G.N. 156.) |

# Movements of New Settlers.

The following new settlers arrived in the Colony during the month of February, 1929:—

Capt. P. G. Bower.—Arrived from Great Britain on 1st February, 1929, and has acquired land in the vicinity of Nyamandhlovu.

M. B. Fitzgibbon.—Arrived from the Union of South Africa on 5th February, 1929, on tour of inspection.

Mr. and Mrs. H. White and family.—Arrived from the Union of South Africa on 6th February, 1929, and now managing Highlands Farm for Mrs. Watkinson, Nyabira.

N. J. Mundy.—Arrived from Canada on 8th February, 1929, on tour of inspection.

A. W. Vigers.—Arrived from Great Britain on 8th February, 1929, and proceeded to Mr. Keys, Poltimore Farm, Marandellas, for a period of training.

A. Fredericks.—Arrived from the Union of South Africa on 11th February, 1929, on tour of inspection, and returned to Bulawayo.

S. Macnuir.—Arrived from Great Britain on 12th February, 1929, and proceeded to Mr. Black, Argyle Farm, Sinoia, for a period of training.

Capt. F. S. A. Anderson.—Arrived from Great Britain on 12th February, 1929, and proceeded to Mr. Light, Lucknow Farm, Concession, for a period of training.

Mr. and Mrs. C. C. Baron.—Arrived from India *en route* for England on tour of inspection.

E. C. F. Giffard.—Arrived from Great Britain and proceeded to Colonel Giffard, Mlembwe Farm, Banket, for a period of training.

# Southern Rhodesia Veterinary Report.

## January, 1929.

### AFRICAN COAST FEVER.

No fresh outbreaks and no cases of disease at any of the existing centres of infection.

### CONTAGIOUS OPHTHALMIA OF CATTLE.

Prevalent in the Salisbury, Hartley and Plumtree districts.

### SWEATING SICKNESS OF CALVES.

Prevalent in the Gwelo and Marandellas districts.

### CUTANEOUS MYIASIS (SCREW WORM) OF CATTLE.

A few cases reported in Bulawayo and adjoining districts. Prevalent in the Marandellas and Mrewa districts.

### HEARTWATER IN CATTLE.

A few cases reported from the Gwanda district.

### HORSE-SICKNESS.

The following mortality was reported:—Bulawayo, 2; Melsetter, 2.

### TRYPANOSOMIASIS.

In the Melsetter district eight head of cattle died.

### IMPORTATIONS.

From the Union of South Africa:—Bulls, 13; cows, 4; heifers, 11; horses, 2; donkeys, 44; sheep, 1,239; goats, 512.

## EXPORTATIONS.

Cattle.—To Union of South Africa for local consumption, 66. To Belgian Congo:—Slaughter, 2,222; breeding, 272. To Northern Rhodesia:—Breeding, 12.

Miscellaneous.—To Northern Rhodesia:—Sheep, 165; goats, 90. To Belgian Congo:—Pigs, 241. To Union of South Africa:—Pigs, 29; horses, 2.

## COLD STORAGE EXPORTS TO BELGIAN CONGO.

Beef:—Forequarters, 309; hindquarters, 324; livers, 118; tongues, 291; hearts, 85; tails, 57; tripes, 20; brains, 84. Calves:—Carcases, 31; feet, 120; heads, 39. Pigs:—Carcases, 37. Sheep:—Carcases, 7; livers, 58; brains, 100. Goats:—Carcases, 49.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

# Colonial Veterinary Service.

The establishment of a School of Tropical Veterinary Science modelled on the lines of the London School of Tropical Medicine is one of the recommendations of the committee on the Colonial Veterinary Service appointed by the Colonial Secretary in July, 1927. The report suggests that suitable accommodation might be made available either at the Research Institute of the Royal Veterinary College, Camden Town, London, or in the premises of the Seamen's Hospital, Endsleigh Gardens, London, formerly occupied by the London School of Tropical Medicine. The committee estimate that the capital outlay necessary for the conversion of an existing institution into a School of Tropical Veterinary Science will be about £3,000 to £5,000, and that the current expenditure, including salaries, rent, maintenance, etc., will be about £12,000 per annum. The creation of a unified Colonial veterinary service is also recommended, with salaries graded from £600-£750 to £2,000-£3,000 for the highest grade.—(*Live Stock Journal.*)

# Southern Rhodesia Weather Bureau.

## FEBRUARY, 1929.

**Pressure.**—During the month pressure was low, varying from 0.002 in. below normal at Umtali to 0.033 in. below normal at Fort Victoria.

Early February was marked by an unusually deep equatorial low. A cyclone was recorded at Beira on the evening of the 1st; its effect showed on the weather map of the 2nd only. An equatorial low moved across on the 3rd and lay immediately west of Rhodesia from the 3rd to the 6th, bringing very heavy rain. During the middle period a southerly low traversed a very unusual path. The low appeared on the south-east coast on the 11th and 12th, and moved up the coast, appearing to be off Lourenco Marques on the 15th; it then retraced its path. No definite low showed off the coast, but the equatorial low extended well into the Union. This low was stationary on the 16th and 17th and then swung back to the Cape as a southerly low appeared on the 18th; this low followed a normal course and moved off on the 22nd. The equatorial low was fairly active during the latter part of the month, but did not affect Rhodesian pressure.

Three southerly highs were in evidence; the first moved round the south coast from the 4th to the 7th, was inland on the 8th and off the east coast from the 9th to the 10th. The second moved along the south coast on the 14th and 15th. The third was on the west coast from the 18th to the 21st. and then moved round the south coast. An unusual high of unknown origin appeared off Beira on the 18th and remained there until the 25th.

**The Cyclone at Beira.**—A cyclone passed Beira between 9 p.m. and 3 a.m. on the night of the 1st and 2nd. The lowest pressure recorded at the Observatory was 29.33 ins. At 10.30 p.m. the wind swung from south, at 9 p.m. through

east-south-east to east, and reached a velocity of 82 miles per hour maximum.

This cyclone affected stations on our border. The Umtali barograph recorded a minimum of pressure at 10.30 a.m. on the 2nd, and indicates a fall of 0.20 in. from midnight; the pressure returned to normal at about 8 p.m. No trace of the cyclone's passage appears on the Salisbury barograph. Complete information as to the sequence of events at Beira has not been received. From the run of the wind it would appear that the cyclone was moving in a north-westerly direction, and that its centre passed to the north of Beira.

The run of the Robinson anemometer on the 2nd at Umtali amounted to 185 miles for the 24 hours, which is unusually high; and the observer at Melsetter records an estimated wind velocity of 60 miles per hour on the 3rd. Violent rain storms were reported along the border on the 2nd inst., the greatest precipitation occurring at Norseland, south of Umtali, where 10.17 ins. was recorded in 24 hours.

**Temperature.**—The mean temperature for the month was about normal, varying from 3.4° F. below normal at Holly's Hope, Matobo, to 1.8° F. above normal at Sipolilo.

The mean maximum temperatures were about normal, varying from 5.1° F. below normal at Hartley to 2.5° F. above at Essexvale, Sipolilo and Tuli.

The mean minimum temperatures varied from 2.7° F. below normal at Tuli to 2.7° F. above normal at Enkeldoorn.

The relative humidity was uniformly high.

A meteorite was observed on the evening of the 15th at about 6.15 p.m. and was reported by a number of observers between Sinoia and Mrewa.

**Rain Periods.**—Rain fell in two periods during the month. The main precipitation occurred with the cyclone and northerly low early in the month. Rain was general from the 1st to the 6th; showers were fairly general on the 7th; during the period from the 8th to the 25th isolated showers were recorded every day. From the 22nd to the 24th scattered showers fell in north Mashonaland, and on the 25th in the Midlands. Light showers were fairly general from the 26th to the 28th.

*Heavy Rains.*—On the 2nd February 8.26 ins. was recorded at Stapleford, Umtali, and 8.16 ins. at Sheba, in the neighbourhood. On the 3rd big falls were recorded on the border south of Umtali: Laurenceville 8.30 ins., Cloudlands 8.86 ins. and Norseland 10.17 ins. The latter fall is the heaviest amount that has ever been recorded at an official rainfall station.

**Rainfall.**—The rainfall for the month amounted to 6.24 ins., as compared with the normal of 6.05 ins. The distribution was as follows:—

| Zone. | Rainfall, ins., Feb., 1929. | Normal, ins. |
|---|---|---|
| A | 5.7 | 5.0 |
| B | 6.9 | 3.9 |
| C | 5.3 | 7.3 |
| D | 5.2 | 7.7 |
| E | 7.1 | 5.3 |
| F | 13.9 | 10.7 |

It will be noticed that Zones C and D, which were only slightly affected by the cyclone and the equatorial low, are considerably below normal.

## RAINFALL.

| Station. | 1929. Jan. | 1929. Feb. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE A.: | | | | |
| Bubi— | | | | |
| Bembesi Railway ... | 9.51 | 7.92 | 27.04 | 19.68 |
| Glenarton ... | 4.71 | ... | ... | 18.76 |
| Inyati ... | 14.35 | 6.21 | 31.73 | 20.10 |
| Judsonia ... | 10.15 | 7.53 | 26.41 | n.s. |
| Martha Farm ... | 9.47 | 7.17 | 23.50 | 15.08 |
| Nduba Farm ... | 10.92 | 4.96 | 29.88 | n.s. |
| Shangani Estate ... | 12.55 | 7.80 | 27.74 | 20.25 |
| Bulalima-Mangwe— | | | | |
| Centenary ... | 7.98 | ... | ... | n.s. |
| Kalaka ... | 7.16 | 8.24 | 23.19 | 17.22 |
| Riverbank ... | 5.83 | 7.94 | 21.23 | 19.83 |
| Solusi Mission ... | 5.09 | 7.75 | 19.31 | 19.50 |
| Bulawayo— | | | | |
| Fairview Farm ... | 7.15 | 6.44 | 25.26 | 17.75 |
| Keendale ... | 7.53 | 5.83 | 22.32 | 17.45 |
| Lower Rangemore ... | 8.52 | 5.23 | 26.77 | 18.84 |
| Observatory ... | 7.61 | 7.43 | 26.22 | 19.29 |
| Waterworks ... | 8.53 | 6.11 | 25.56 | 18.49 |
| Gwelo— | | | | |
| Brockenhurst ... | 6.53 | 6.54 | 27.06 | n.s. |
| Frogmore ... | 9.23 | 7.48 | 31.12 | n.s. |
| Gwelo Gaol ... | 7.73 | 6.13 | 28.07 | 21.72 |
| Riversdale Estate ... | 8.32 | 8.04 | 24.88 | 22.22 |
| Somerset Estate ... | 9.29 | 9.63 | 27.57 | 20.90 |
| Insiza— | | | | |
| Orangedale ... | 10.44 | 8.70 | 27.63 | 21.57 |
| Shangani ... | 10.39 | 5.59 | 27.03 | 20.11 |
| Thornville ... | 9.99 | 5.89 | 28.74 | 19.38 |
| Nyamandhlovu— | | | | |
| Gwaai Reserve ... | 8.86 | 6.40 | 26.15 | 16.36 |
| Gwaai Siding ... | 9.11 | 5.73 | 25.93 | n.s. |
| Naseby ... | 7.33 | 9.43 | 25.10 | 18.04 |
| Nyamandhlovu Railway ... | 4.09 | 5.57 | 22.02 | 18.72 |
| Sebungwe— | | | | |
| Gokwe ... | 11.69 | 5.00 | 27.38 | 24.98 |
| Umzingwane— | | | | |
| Springs ... | 8.47 | 7.21 | 26.24 | 19.41 |
| Wankie— | | | | |
| Dett ... | 11.90 | 4.96 | 28.76 | 16.93 |
| Matetsi Railway ... | 8.39 | ... | ... | 23.44 |
| Ngamo Railway ... | 7.43 | 4.04 | 21.08 | 20.68 |
| Rosslyn ... | 9.96 | 7.55 | 24.13 | n.s. |
| Sukumi ... | 13.33 | 5.67 | 29.51 | 20.82 |
| Tom's Farm ... | 15.69 | 4.97 | 31.22 | n.s. |
| Victoria Falls ... | 10.67 | 2.93 | 20.74 | n.s. |
| Victoria Falls Railway ... | 9.87 | 2.89 | 20.26 | 23.90 |
| Wankie Hospital ... | 10.73 | 3.33 | 20.06 | 19.60 |

## RAINFALL—*(Continued)*.

| Station. | 1929. Jan. | 1929. Feb. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone B.:** | | | | |
| Belingwe— | | | | |
| Bickwell ... | 5.73 | 9.25 | 23.99 | 17.39 |
| Sovelele ... | 8.50 | 9.42 | ... | 15.83 |
| Tamba ... | 5.81 | 9.31 | 21.67 | 15.09 |
| Wedza ... | 6.41 | 11.06 | ... | 18.40 |
| Bulalima-Mangwe— | | | | |
| Bruwapeg ... | 4.66 | 7.18 | 16.75 | 16.01 |
| Edwinton ... | 8.46 | 9.02 | 32.39 | 17.85 |
| Empandeni ... | 7.34 | 6.71 | 20.47 | 18.04 |
| Fallowfields ... | 5.34 | 7.51 | 19.98 | n.s. |
| Garth ... | 9.66 | 9.06 | 28.89 | 21.33 |
| Maholi ... | 7.10 | 9.89 | 28.18 | 22.93 |
| Retreat ... | 5.85 | 6.94 | 25.98 | 17.66 |
| Sandown ... | 8.91 | 7.16 | 24.39 | 19.88 |
| Semokwe Reserve ... | 6.03 | 6.90 | 17.21 | n.s. |
| Tjankwa ... | 9.98 | 7.62 | 29.04 | 22.08 |
| Tjompani ... | 13.72 | 9.44 | 36.33 | 19.34 |
| Chibi— | | | | |
| Bubye ... | 3.01 | ... | ... | 10.90 |
| Mtendelende ... | 4.95 | 6.26 | ... | 6.21 |
| Nuanetsi Homestead ... | 5.38 | 4.40 | 18.71 | 12.83 |
| Nuanetsi N.C. ... | 7.42 | 4.00 | 21.54 | n.s. |
| Gwanda— | | | | |
| Gwanda Gaol ... | 7.44 | 8.44 | 24.68 | 17.07 |
| Limpopo ... | 4.32 | ... | ... | 9.97 |
| Mazunga ... | ... | ... | ... | 13.66 |
| Mtetengwe ... | 2.23 | 4.24 | 12.04 | 9.65 |
| Tuli ... | 4.40 | 6.71 | 18.49 | 11.77 |
| Insiza— | | | | |
| Albany ... | 10.77 | 7.55 | 26.27 | 19.63 |
| Filabusi ... | 5.85 | 8.51 | 23.39 | 18.25 |
| Fort Rixon ... | 8.79 | 6.34 | 22.78 | 18.61 |
| Inyezi ... | 7.35 | 8.41 | 25.90 | 18.19 |
| Lancaster ... | 6.97 | 9.13 | 25.47 | 18.76 |
| Scaleby ... | 6.11 | 6.85 | 20.62 | n.s. |
| Wanezi Mission ... | 7.87 | 8.10 | 25.38 | n.s. |
| Matobo— | | | | |
| Bon Accord ... | 7.97 | 10.24 | 24.25 | n.s. |
| Fort Usher ... | 4.91 | 10.21 | 26.57 | n.s. |
| Holly's Hope ... | 7.28 | 9.53 | 25.28 | 16.83 |
| Longsdale ... | 6.05 | 8.05 | 25.73 | n.s. |
| Matopo Mission ... | 8.35 | 8.93 | 29.36 | 21.18 |
| Mtshabezi Mission ... | 7.40 | 6.36 | 23.36 | 17.85 |
| Rhodes Matopo Park ... | 15.60 | ... | ... | 19.69 |
| Umzingwane— | | | | |
| Balla Balla ... | 5.71 | ... | ... | 19.56 |
| Essexvale ... | 8.49 | 10.62 | 30.22 | 19.94 |
| Hope Fountain ... | 8.51 | 8.48 | 28.39 | 22.05 |

## RAINFALL—(*Continued*).

| Station. | 1929. Jan. | 1929. Feb. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone C.:** | | | | |
| Charter— | | | | |
| Bushy Park ... | 12.25 | ... | ... | 23.95 |
| Enkeldoorn ... | 15.33 | 6.40 | 37.86 | 24.42 |
| Marshbrook ... | 11.04 | 6.20 | 28.61 | 24.37 |
| The Range ... | 11.10 | 6.34 | 32.06 | 25.55 |
| Vrede ... | 11.30 | 6.24 | 27.30 | 24.93 |
| Chilimanzi— | | | | |
| Beacon Hill ... | 11.01 | 6.27 | 30.78 | 23.48 |
| Central Estates ... | 15.75 | 7.33 | 37.16 | 25.85 |
| Fourie's Post ... | 14.42 | 4.62 | 30.62 | 21.35 |
| Orton's Drift ... | 13.59 | 4.79 | 30.28 | 20.74 |
| Sebakwe Post ... | 12.48 | 3.54 | 25.98 | 20.12 |
| Umvuma Railway ... | 9.94 | 6.18 | 28.33 | 23.11 |
| Gwelo— | | | | |
| Cross Roads ... | 9.95 | 6.72 | 30.66 | 23.31 |
| Delano Estate ... | 9.03 | 9.78 | 30.92 | n.s. |
| East Clare Ranch ... | 10.69 | 5.29 | 26.74 | 25.87 |
| Forestvale ... | 11.58 | 6.42 | 31.78 | n.s. |
| Globe and Phœnix Mine ... | 8.72 | 9.70 | 29.12 | 23.71 |
| Lannes Farm ... | 8.34 | 9.83 | 26.93 | n.s. |
| Lalapanzi ... | 9.93 | 6.15 | 27.70 | 26.76 |
| Lyndene ... | 8.10 | 5.66 | 26.85 | 21.57 |
| Woodendhove ... | 10.16 | 8.24 | 32.65 | 24.63 |
| Wold Farm ... | 8.50 | 6.78 | 31.66 | n.s. |
| Hartley— | | | | |
| Ardgowan ... | 6.09 | ... | ... | 25.86 |
| Balwearie ... | 11.30 | 8.52 | 28.45 | 25.93 |
| Battlefields ... | 12.38 | 5.61 | 31.96 | 24.17 |
| Beatrice ... | 7.98 | 6.04 | 29.77 | 26.13 |
| Carnock ... | 7.76 | 2.91 | 23.43 | 25.39 |
| Cromdale ... | 10.41 | 4.24 | 27.80 | 24.85 |
| Currandooley ... | 7.46 | 6.11 | 25.52 | n.s. |
| Eiffel Blue Mine ... | 7.48 | 6.32 | 21.90 | 21.58 |
| Elvington ... | 7.27 | 3.73 | 28.62 | 25.58 |
| Gatooma ... | 8.18 | 5.45 | 23.81 | 26.85 |
| Gatooma Experiment Station | 7.36 | 7.06 | 22.25 | n.s. |
| Gowérlands ... | 9.08 | 6.16 | 28.73 | 25.36 |
| Handley Cross ... | 8.79 | 7.25 | 24.86 | n.s. |
| Hartley Gaol ... | 9.04 | 7.10 | 27.03 | 27.14 |
| Hopewell ... | 9.14 | 6.01 | 24.76 | 25.43 |
| Jenkinstown ... | 8.55 | ... | ... | 24.69 |
| Maida Vale ... | 7.65 | 5 20 | 23.09 | 23.13 |
| Meadowlands ... | 8.02 | 3.92 | 26.52 | n.s. |
| Nyadgori ... | 7.54 | 5.75 | 21.91 | 23.10 |
| Pulham ... | 10.55 | 4.15 | 26.58 | 27.16 |
| Ranwick ... | 6.98 | 4.47 | 20.83 | 27.39 |
| Sunny Bank ... | 7.82 | 5.19 | 24.48 | n.s. |
| Thorndyke ... | 9.14 | 5.58 | 22.96 | 22.52 |

## RAINFALL—(*Continued*).

| STATION. | 1929. Jan. | Feb. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE C.—(Continued) | | | | |
| Lomagundi— | | | | |
| Argyle ... | 11.72 | 3.93 | 24.83 | 26.63 |
| Baguta ... | 10.59 | 2.61 | 25.05 | 27.28 |
| Between Rivers ... | 8.71 | 5.28 | 23.48 | n.s. |
| Citrus Estate ... | 8.47 | 3.02 | 23.54 | 24.92 |
| Dalston ... | 8.00 | 4.80 | 22.57 | n.s. |
| Dartmoor ... | 9.62 | 3.31 | 19.93 | n.s. |
| Darwendale ... | 6.98 | 5.04 | 23.07 | 24.99 |
| Dedsi ... | 13.94 | 3.59 | 29.38 | 25.90 |
| Dingley Dell ... | 10.18 | 3.11 | 21.14 | 22.36 |
| Gambuli ... | 13.07 | 2.60 | 25.45 | 28.37 |
| Hartleyton ... | ... | ... | ... | n.s. |
| Kapiri ... | 13.44 | 3.31 | 24.26 | 25.72 |
| Kashao ... | 7.38 | 5.58 | 23.01 | n.s. |
| Kenidia ... | 5.89 | 3.65 | 16.99 | n.s. |
| Mafoota ... | 9.33 | 7.80 | 28.39 | 24.58 |
| Maningwa ... | 14.62 | 2.26 | 24.57 | 26.19 |
| Miami ... | 15.89 | 4.64 | 25.69 | n.s. |
| Mica Field ... | 19.57 | 4.67 | 30.19 | 23.13 |
| Montrose ... | 9.45 | 3.57 | 23.79 | 24.92 |
| Mpandegutu ... | 5.67 | 5.49 | 21.26 | 25.42 |
| Msina ... | 11.38 | 3.23 | 23.84 | n.s. |
| Mukwe River Ranch ... | 14.11 | 5.91 | 30.66 | 24.50 |
| Nyapi ... | 6.95 | 2.55 | 21.53 | 24.90 |
| Nyarora ... | 12.18 | 3.08 | 21.87 | 24.08 |
| Nyati ... | 18.92 | ... | ... | 20.72 |
| Palm Tree Farm ... | 11.64 | 2.16 | 23.51 | 24.87 |
| Pendennis ... | 12.19 | 3.70 | 24.71 | n.s. |
| Raffingora ... | 10.19 | 3.43 | 27.98 | 23.54 |
| Renardia ... | 11.40 | 6.47 | 26.42 | n.s. |
| Richmond ... | 10.24 | 4.10 | 26.48 | 21.60 |
| Robbsdale ... | 10.51 | 4.40 | 27.62 | n.s. |
| Romsey ... | 10.83 | 4.03 | 27.73 | 24.45 |
| Silater Estate ... | 9.13 | 4.59 | 26.25 | 27.57 |
| Sinoia ... | 10.74 | 1.92 | 24.25 | 26.03 |
| Sinoia's Drift ... | ... | ... | ... | n.s. |
| Sipolilo ... | 14.30 | 3.66 | 33.60 | 27.22 |
| Umvukwe Ranch ... | 5.91 | 9.30 | 23.08 | 27.83 |
| Woodleigh ... | 6.32 | 5.93 | 20.77 | 26.75 |
| Yeanling ... | 10.28 | 3.50 | 21.42 | 25.18 |
| Zebra Vlei ... | 10.22 | 3.26 | 23.38 | 24.13 |
| Marandellas— | | | | |
| Rocky Spruit ... | 18.00 | 6.45 | 44.10 | n.s. |
| Mazoe— | | | | |
| Pembi Ranch ... | 10.62 | 5.95 | 29.57 | n.s. |
| Salisbury— | | | | |
| Avondale (Broadlands) ... | 11.04 | 5.35 | 25.46 | 26.84 |
| Ballineety ... | 8.89 | 3.44 | 24.30 | 24.50 |
| Botanical Experiment Station | 11.52 | 4.04 | 24.82 | 22.36 |
| Bromley ... | 11.19 | 4.75 | 26.89 | 26.39 |

## RAINFALL—(*Continued*).

| Station. | 1929. Jan. | 1929. Feb. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone C.—(Continued)** | | | | |
| Salisbury (continued)— | | | | |
| Cleveland Dam ... | 14.48 | 3.80 | 30.10 | 25.54 |
| Forest Nursery ... | 12.51 | 2.57 | 24.95 | 25.90 |
| Gwebi ... | 12.58 | 2.79 | 25.10 | 26.23 |
| Salisbury Agricultural Dept. | 11.98 | 3.91 | 24.54 | 23.32 |
| Sebastopol ... | 14.18 | 7.72 | 34.69 | 26.31 |
| Stapleford ... | 12.89 | 3.89 | 28.60 | 27.80 |
| Tobacco Experiment Station | 10.05 | 3.55 | 21.81 | n.s. |
| Western Commonage ... | 9.45 | 5.43 | 25.46 | 21.97 |
| Sebungwe— | | | | |
| Sikombela ... | 14.96 | 5.94 | 29.01 | 25.42 |
| Wolverley ... | 13.80 | 8.35 | 33.63 | 20.37 |
| **Zone D. :** | | | | |
| Darwin— | | | | |
| Chikoa ... | ... | ... | ... | n.s. |
| Cullinan's Ranch ... | 10.67 | 2.68 | 22.68 | n.s. |
| M'gadzi ... | 12.52 | 2.42 | 26.03 | n.s. |
| Mount Darwin ... | 10.77 | 5.54 | 21.74 | 25.86 |
| Rusambo ... | 8.57 | 4.14 | 18.47 | n.s. |
| Inyanga— | | | | |
| Inyanga ... | 16.99 | 6.48 | 40.29 | 30.13 |
| Juliasdale ... | 15.68 | 8.53 | 40.14 | 33.05 |
| Rhodes Estate ... | 18.84 | 9.15 | 47.07 | 33.72 |
| Makoni— | | | | |
| Ardlamont ... | 13.13 | 3.44 | 32.61 | n.s. |
| Eagle's Nest ... | 17.14 | 6.97 | 40.75 | 26.26 |
| Mayo Ranch ... | 11.69 | 3.41 | 28.70 | n.s. |
| Wensleydale ... | 10.60 | 3.33 | 28.11 | 25.28 |
| Mazoe— | | | | |
| Argyle Park ... | 11.85 | 2.99 | 28.01 | n.s. |
| Atherstone ... | 8.74 | 2.34 | 23.79 | 26.47 |
| Bellevue ... | 11.72 | 3.38 | 23.78 | n.s. |
| Bindura ... | 10.73 | 1.82 | 21.95 | 26.15 |
| Ceres ... | 14.37 | 5.12 | 32.91 | 29.78 |
| Chipoli ... | 9.14 | 5.28 | 24.46 | 26.58 |
| Citrus Estate ... | 10.17 | 5.56 | 29.21 | 27.74 |
| Craigengower ... | 8.42 | 3.37 | 28.08 | 27.07 |
| Dandejena ... | 11 76 | 6.64 | 33.82 | n.s. |
| Donje ... | 13.47 | 5.38 | 32.01 | n.s. |
| Frogmore ... | 9.75 | 5.46 | 26.86 | 26.40 |
| Glen Divis ... | 11.33 | 2.78 | 27.43 | 29.64 |
| Glen Grey ... | 10.84 | 3.72 | 26.05 | 23.90 |
| Great B ... | 12.38 | 5.24 | 25.06 | 27.08 |
| Hinten ... | 8.61 | 3.84 | 22.94 | n.s. |
| Horta ... | 8.74 | 3.92 | 27.47 | n.s. |
| Kilmer ... | 9.29 | 3.35 | 28.45 | 27.09 |
| Kingston ... | 12.53 | 3.85 | 30.76 | 29.93 |
| Maienza ... | 14.39 | 6.27 | 35.54 | 27.90 |

## RAINFALL—(*Continued*).

| Station. | 1929. Jan. | 1929. Feb. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone D.—(Continued)** | | | | |
| Mazoe (continued)— | | | | |
| Mazoe Dam ... | 8.53 | 4.73 | 22.07 | 27.48 |
| Mgutu ... | 15.03 | 4.52 | 29.11 | 29.08 |
| Muripfumba ... | 11.61 | 3.45 | 25.68 | 24.18 |
| Omeath ... | 8.89 | 6.58 | 30.21 | 26.48 |
| Pearson Settlement ... | 13.17 | 4.78 | 26.81 | 26.08 |
| Riversdale Estate ... | 9.69 | 5.36 | 25.31 | n.s. |
| Ruia ... | 10.96 | 6.64 | 31.56 | 28.86 |
| Rustington ... | 13.55 | 3.43 | 29.16 | 24.42 |
| Shamva Mine ... | 11.07 | 3.60 | 27.36 | 27.19 |
| Stanley Kop ... | 8.50 | 2.60 | 20.89 | 25.11 |
| Sunnyside ... | 9.52 | 7.18 | 29.31 | 27.45 |
| Teign ... | 9.88 | 3.96 | 27.85 | 27.38 |
| Usk ... | 12.87 | 4.25 | 30.78 | 31.25 |
| Virginia ... | 10.65 | 3.47 | 28.85 | 26.01 |
| Visa ... | 9.02 | 4.63 | 25.71 | n.s. |
| Woodlands ... | 12.49 | 5.11 | 30.52 | 28.59 |
| Zombi Farm ... | 11.22 | 4.29 | 29.50 | 29.97 |
| Mrewa— | | | | |
| Maryland ... | 8.48 | 3.81 | 25.60 | n.s. |
| Montclair ... | 10.33 | 4.53 | 30.13 | n.s. |
| Mrewa ... | 14.69 | 1.23 | 28.66 | 28.61 |
| Nyaderi Mission ... | 6.34 | 6.36 | 24.07 | n.s. |
| Selous Nek ... | 9.06 | 4.08 | 22.82 | 28.16 |
| Mtoko— | | | | |
| Makaha ... | 10.37 | 8.56 | 33.24 | 28.37 |
| Mtoko (N.C.) ... | 7.71 | 6.85 | 29.54 | 24.18 |
| Salisbury— | | | | |
| Arcturus ... | 13.40 | 4.63 | 33.38 | 29.55 |
| Chindamora Reserve ... | 10.99 | 4.48 | 24.48 | 27.04 |
| Datata ... | 13.04 | 4.86 | 33.92 | n.s. |
| Glenara ... | 13.11 | 6.39 | 27.40 | 26.75 |
| Goromonzi ... | 10.47 | 5.64 | 32.89 | 28.94 |
| Hatcliffe ... | 12.60 | 3.17 | 23.83 | 27.75 |
| Hillside (Bromley) ... | 13.01 | 4.02 | 28.55 | 28.05 |
| Kilmuir ... | 14.07 | 4.45 | 34.98 | 31.24 |
| Meadows ... | 14.75 | 8.21 | 37.14 | 31.28 |
| Pendennis ... | 14.96 | 4.05 | 27.77 | n.s. |
| Selby ... | 15.84 | 3.74 | 31.40 | 25.19 |
| Springs ... | 14.04 | 3.31 | 29.85 | 27.00 |
| Teviotdale ... | 14.83 | 4 27 | 26.83 | n.s. |
| Vainona ... | 15.25 | 4.19 | 29.34 | 26.18 |
| **Zone E.:** | | | | |
| Belingwe— | | | | |
| Belingwe (N.C.) ... | 5.23 | 9.37 | 24.90 | 18.60 |
| Doro ... | 5.22 | 7.90 | 23.31 | 17.84 |
| Shabani ... | 6.41 | 7.77 | 26.76 | 18.66 |

## RAINFALL—*(Continued).*

| Station. | 1929. Jan. | 1929. Feb. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone E.—(Continued)** | | | | |
| **Bikita—** | | | | |
| Angus Ranch ... | 4.11 | 6.92 | 19.63 | 16.45 |
| Bikita ... | 10.38 | 8.35 | 26.13 | 25.60 |
| Devuli Ranch ... | 5.16 | ... | ... | 16.50 |
| Pamushana ... | 11.25 | 6.87 | 29.98 | 28.24 |
| **Charter—** | | | | |
| Buhera ... | 21.19 | 7.32 | 38.49 | 26.75 |
| **Chibi—** | | | | |
| Chibi ... | 8.63 | 4.01 | 24.54 | 19.10 |
| Lundi ... | 9.01 | ... | ... | 19.26 |
| Mpapas ... | 6.24 | 4.81 | 22.13 | 10.13 |
| **Chilimanzi—** | | | | |
| Allanberry ... | 11.14 | 6.82 | 30.80 | 22.84 |
| Driefontein ... | 12.52 | 5.73 | 31.38 | 22.08 |
| Felixburg ... | 11.63 | 5.60 | 28.97 | 22.50 |
| Grootfontein ... | 11.14 | 5.70 | 33.12 | 21.80 |
| Induna Farm ... | 7.57 | 7.82 | 30.87 | 25.50 |
| Mtao Forest ... | 8.83 | 7.78 | 29.74 | 23.55 |
| Mukowries ... | 16.23 | 5.52 | 39.40 | n.s. |
| Thornhill ... | 15.63 | 4.39 | 33.89 | n.s. |
| **Gutu—** | | | | |
| Alheit Mission ... | 16.92 | 7.89 | 36.16 | 19.32 |
| Devuli Store ... | 16.37 | ... | ... | n.s. |
| Eastdale Estates ... | 12.11 | 11.11 | 38.45 | 25.13 |
| Gutu (N.C.) ... | 14.74 | 5.73 | 35.37 | 23.70 |
| Glenary ... | 14.10 | 6.27 | 36.05 | 20.06 |
| **Gwelo—** | | | | |
| Glencraig ... | 10.54 | 4.67 | 34.59 | n.s. |
| Partridge Farm ... | 8.39 | 6.62 | 30.68 | 25.75 |
| Sheep Run Farm ... | 9.06 | 6.57 | 30.40 | 21.85 |
| **Inyanga—** | | | | |
| St. Trias' Hill ... | 14.50 | 4.70 | 36.49 | 30.38 |
| **Insiza—** | | | | |
| Roodeheuvel ... | 12.05 | 8.18 | 29.08 | 21.40 |
| Stoneham (Brac Valley) ... | 14.01 | 8.81 | 32.93 | n.s. |
| **Makoni—** | | | | |
| Bude ... | 10.26 | 8.15 | 32.98 | n.s. |
| Chirumwe ... | 15.11 | 7.25 | 38.57 | n.s. |
| Craigendoran ... | 9.55 | 10.01 | 31.90 | 26.09 |
| Forest Hill ... | 12.37 | 6.08 | 38.99 | 28.05 |
| Inyagura ... | 14.69 | 6.79 | 36.90 | n.s. |
| Mona ... | 11.73 | 5.57 | 41.64 | 29.31 |
| Monte Cassino ... | 12.87 | 6.36 | 35.66 | 27.69 |
| Ruati ... | 13.85 | 6.33 | 41.87 | n.s. |
| Rusape (N.C.) ... | 13.03 | 6.49 | 31.57 | n.s. |
| Springs ... | 11.85 | 6.34 | 34.83 | 27.08 |
| Tablelands ... | ... | ... | ... | 30.19 |
| Whitgift ... | 13.80 | 7.61 | 38.37 | n.s. |

## RAINFALL—*(Continued)*.

| Station. | 1929. Jan. | 1929. Feb. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| Zone E.—(Continued) | | | | |
| Marandellas— | | | | |
| Bonongwe ... | 16.82 | 6.42 | 42.43 | 26.00 |
| Delta ... | 14.96 | 6.41 | 38.73 | 29.49 |
| Elandslaagte ... | 18.12 | 6.73 | 41.90 | 24.49 |
| Lushington ... | 15.50 | 5.92 | 34.99 | n.s. |
| Macheke ... | 17.15 | 6.78 | 39.62 | 27.43 |
| Marandellas (N.C.) ... | 10.26 | 4.59 | 32.46 | 28.71 |
| Marandellas Estate ... | 13.51 | 6.24 | 35.49 | 25.21 |
| Nelson ... | 16.68 | 6.11 | 35.14 | 23.92 |
| Wedza Reserve ... | 22.60 | 5.39 | 45.66 | n.s. |
| Wenimbi ... | 9.35 | 6.59 | 28.48 | n.s. |
| Melsetter— | | | | |
| Brackenbury ... | ... | ... | ... | 41.94 |
| New Year's Gift ... | 8.30 | 9.14 | 30.64 | n.s. |
| Sabi Tanganda Estate ... | 6.65 | 6.54 | 22.33 | n.s. |
| Tom's Hope West ... | 28.25 | 13.07 | 62.94 | n.s. |
| Ndanga— | | | | |
| Bangala Ranch ... | 8.60 | ... | ... | n.s. |
| Doornfontein ... | 9.28 | 6.60 | 30.43 | 21.25 |
| Marah Ranch ... | ... | ... | ... | 24.71 |
| Triangle Ranch ... | 6.16 | ... | ... | 16.12 |
| Zaka ... | 14.25 | 7.93 | 32.49 | n.s. |
| Selukwe— | | | | |
| Aberfoyle Ranch ... | 14.01 | ... | ... | 22.10 |
| Hillingdon ... | 16.48 | 7.93 | 35.09 | 26.17 |
| Impali Source ... | 13.74 | 8.65 | 32.50 | 21.70 |
| Rio ... | 13.13 | 5.51 | 32.15 | 24.41 |
| Safago ... | 10.97 | 6.99 | 31.49 | 26.43 |
| Selukwe ... | 19.73 | 12.18 | 45.31 | 30.52 |
| Umtali— | | | | |
| Argyle ... | 13.70 | 8.64 | 33.83 | 27.03 |
| Embeza ... | 27.91 | ... | ... | n.s. |
| Fairview ... | 16.28 | 8.37 | 41.96 | n.s. |
| Fern Valley ... | ... | ... | ... | 28.01 |
| Jerain ... | 14.32 | 8.38 | 39.71 | 24.36 |
| Mutambara Mission ... | 9.83 | 10.97 | 35.56 | 23.01 |
| Odzani Power Station ... | 13.17 | 14.36 | 49.83 | 28.98 |
| Park Farm ... | 17.90 | 16.40 | 54.14 | 32.04 |
| Premier Estate ... | 14.74 | 8.20 | 41.57 | 24.86 |
| Sarum ... | 15.00 | 7.73 | 37.86 | 24.67 |
| Sheba ... | 27.80 | 16.69 | 62.32 | n.s. |
| Stapleford ... | 34.97 | 19.73 | 79.27 | 51.86 |
| St. Augustine's Mission ... | 15.57 | 10.75 | 47.05 | 30.63 |
| Transsau Estate ... | 10.55 | 7.63 | 31.62 | 24.26 |
| Umtali Gaol ... | 14.90 | 10.80 | 44.70 | 24.29 |
| Victoria— | | | | |
| Bruceham ... | 10.69 | 5.12 | 29.32 | 21.70 |
| Cambria ... | 10.59 | 4.06 | 26.96 | 17.19 |
| Cheveden ... | 7.29 | 6.48 | 26.46 | 25.98 |
| Clipsham ... | 9.79 | 6.26 | 30.91 | 21.87 |

## RAINFALL—*(Continued)*.

| STATION. | | 1929. Jan. | 1929. Feb. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|---|
| ZONE E.—(Continued) | | | | | |
| Victoria (continued)— | | | | | |
| Gokomere | ... | 11.06 | 6.34 | 32.16 | 21.88 |
| Kimberley Ranch | ... | 12.72 | 4.78 | 33.98 | n.s. |
| Mashaba | ... | 12.47 | 5.36 | 32.24 | 21.98 |
| Miltonia | ... | 8.57 | 3.81 | 25.21 | n.s. |
| Riverdene North | ... | 12.75 | 3.96 | 27.97 | 20.31 |
| Salemore | ... | 11.40 | ... | ... | 24.31 |
| Silver Oaks | ... | 10.03 | 5.30 | 28.79 | 22.67 |
| Stanmore | ... | 9.58 | 2.86 | 22.01 | 18.82 |
| Victoria | ... | 9.57 | 4.64 | 27.45 | 20.74 |
| Zimbabwe | ... | 8.39 | 5.74 | 28.47 | 22.73 |
| ZONE F.: | | | | | |
| Melsetter— | | | | | |
| Chikore | ... | 10.73 | 9.38 | 37.48 | 32.29 |
| Chipinga | ... | 13.48 | ... | ... | 32.63 |
| Lettie Swan | ... | 10.97 | 11.82 | 37.04 | n.s. |
| Melsetter | ... | 14.61 | 14.26 | 50.12 | 34.71 |
| Mount Selinda | ... | 16.63 | ... | .. | 43.34 |
| Vermont | ... | 17.11 | 17.43 | 58.59 | 44.60 |
| Umtali— | | | | | |
| Chimeze | ... | ... | ... | ... | 47.63 |
| Cloudlands | ... | 26.38 | 18.44 | 68.99 | n.s. |

# Export of Cattle from Southern Rhodesia, 1929.

| Month | Union | | England. | Congo | | N. Rhodesia | Portuguese East Africa. | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Slaughter | | Slaughter | | | | | | | |
| | Johannesburg | I.C.S. for overseas | On hoof | Slaughter | Breeding | Breeding | Slaughter | Trek | Breeding | |
| January ... | 66 | ... | ... | 2,222 | 272 | 12 | ... | ... | ... | 2,572 |
| February ... | 84 | ... | ... | 656 | ... | ... | 12 | ... | ... | 752 |
| March ... | | | | | | | | | | |
| April ... | | | | | | | | | | |
| May ... | | | | | | | | | | |
| June ... | | | | | | | | | | |
| July ... | | | | | | | | | | |
| August ... | | | | | | | | | | |
| September ... | | | | | | | | | | |
| October ... | | | | | | | | | | |
| November ... | | | | | | | | | | |
| December ... | | | | | | | | | | |

J. M. SINCLAIR,
Chief Veterinary Surgeon.

## Dates of Meetings of Farmers' Associations, Southern Rhodesia.

| Name of Association. | Place of Meeting. | Secretary. | April. | May. |
|---|---|---|---|---|
| | | | 1929 | 1929 |
| Ayrshire—Sipolilo | Various farms | G. H. Cautherley | 13 | 11 |
| Banket Junction | Banket Hotel | A. M. Hutchinson | 5 | 3 |
| Beatrice District | Farmers' Hall, Beatrice | W. Krienke | 25 | 30 |
| Bindura | Bindura Farmers' Hall | W. E. Fricker | 12 | 10 |
| Bromley | Farmers' Hall, Bromley Siding | W. D. Grier | 3 | 1 |
| Bubi | Queen's Mine | C. H. Olsen | 9 | 14 |
| Bulawayo Landowners' and Farmers' Association | Library Buildings, Bulawayo | W. A. Carnegie | 11 | 9 |
| Chakari | Cornucopia (April), Newbiggin (May) | L. T. Tracey | 17 | 15 |
| Daisyfield | Daisyfield (April), Somabula (May) | L. E. Edwards | 20 | 11 |
| Darwendale—Trelawney | Various farms | Charles H. Tanner | 24 | 22 |
| Eastern Districts | Farmers' Hall, Chidza | W. E. Richards | 13 | 11 |
| Enkeldoorn | Enkeldoorn | C. N. Ludlowe | 2 | 7 |
| Enterprise | Farmers' Hall | James Watson | 2 | 7 |
| Essexvale | Essexvale | Col. D. Judson | 21 | 19 |
| Felixburg—Gutu | Dysart (April), Gongwe (May) | A. J. Bradshaw | 13 | 11 |
| Figtree Branch, R.L. and F.A. | Figtree Hotel | The Secretary | 2 | 7 |
| Gadzema | Gadzema | M. G. Leahy | 12 | 10 |
| Gatooma | Speck's Hotel | B. L. Henderson | 20 | 18 |
| Gatooma (Golden Valley Branch) | Golden Valley Hotel | C. K. James | 13 | 11 |
| Gazaland (South Melsetter) | Chipinga Hotel | Mrs. C. N. Reading | 1 | 6 |
| Greystone | Quarrie Farm | P. J. van der Walt | ... | 11 |
| Gwanda | Lowenthal's Building, Gwanda | N. J. B. Nilson | 20 | 18 |
| Hartley | Old Schoolroom, Hartley | Mrs. F. C. Watson | 27 | 25 |
| Headlands | Headlands | J. A. Eve | ... | ... |
| Hunter's Road | Hunter's Road | R. W. Twilley | 27 | 25 |
| Insiza South | Farm Lancaster | J. Campbell | 11 | ... |
| Inyazura | Inyazura | W. P. Frudd | 5 | ... |
| Lalapansi | Lalapansi | B. J. Ingle | 13 | 11 |
| Lomagundi | Sinoia | F. W. Robertson | 12 | ... |
| Lomagundi West | Various farms | A. A. Bisset | 14 | 12 |
| Macheke | Farmers' Hall, Macheke | Major Hastings | ... | ... |

| | | | | |
|---|---|---|---|---|
| Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association | Various Farms | T. R. Colam | 6 | 4 |
| Makwiro | Makwiro | W. L. Parsons | 19 | 17 |
| Marandellas | Marandellas Farmers' Hall | E. Cruikshank | 5 | 3 |
| Marandellas, Southern | Various farms | B. V. Cherry | 3 | 1 |
| Mashonaland | Mashonaland Farmers' Hall, Salisbury | C. Lamb | 12 | 10 |
| Matobo South | Farmers' Hall, Malundi Farm | A. G. Allan | 20 | 18 |
| Matopo Branch, R.L. and F.A. | Farmers' Hall, Malundi | W. Mirtle | 20 | 18 |
| Mazoe (Concession) | Concession Hotel | A. W. Laurie | 12 | 10 |
| Mazoe (Glendale) | Farmers' Hall, Glendale | James S. Brown | 10 | 8 |
| Melsetter | Court House, Melsetter | J. C. Kruger | 11 | 9 |
| Midlands Farmers and Stockowners | Royal Hotel, Gwelo | T. R. van Rooyen | 10 | 8 |
| Ngezi-Umniati | Harvieston, Enkeldoorn | Miss Harvie | 27 | 25 |
| North Umniati | ——— | J. F. Eagar | Not | received |
| Norton and Lydiate District | Norton | R. D. Palmer | 5 | 3 |
| Nyamandhlovu | Nyamandhlovu | R. D. McLean | ... | ... |
| Odzi District Farmers | Odzi Hotel | F. H. Burnett | 6 | 4 |
| Poorte Valley | Various places | A. D. Wilson | 20 | 18 |
| Que Que | Offices of the Que Que Sanitary Board | A. A. Ackerman | 20 | 18 |
| Rusape Farmers' Association | Rusape | R. Munch | 6 | 4 |
| Salisbury South | Various farms | P. Linton | 24 | 29 |
| Selukwe | The Hotel, Selukwe | W. T. Simpson | ... | ... |
| Shamva | Shamva Court House | W. Stanley-Stollard | 19 | 17 |
| Two Rivers Farming Association | Various farms | W. L. Parsons | 20 | 18 |
| Umboe (Branch of Lomagundi F.A.) | Elmley (April) | C. W. S. Ford | 13 | 11 |
| Umvukwe Farmers' and Tobacco Growers' Association | Various ranches | Com. E. Wrightson | 13 | 11 |
| Umtali | Drill Hall, Umtali | A. Howat | 4 | 2 |
| Umvuma and District | Umvuma | S. T. Montgomery | Not | received |
| Victoria | Victoria | G. E. Lamb | 6 | 4 |
| Wankie District | ——— | F. H. Going | Not | received |
| West Umvukwe Farmers' Association | Various farms | G. H. Gordon | 6 | 4 |
| Western | Plumtree Hotel | The Secretary | 13 | 4 |
| Willoughbys | Willoughbys | A. E. Roberts | Not | received |

# Rhodesian Milk Records.

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| Dapple ... | Friesland | 5,051.00 | ... | 180 | A. T. Holland, Chatsworth |
| Princess ... | do | 5,413.00 | ... | 210 | do do |
| Rhoda ... | do | 3,424.00 | ... | 150 | do do |
| Mary ... | do | 3,430.00 | ... | 150 | do do |
| Boontje of Kaalplaats | do | 3,066.00 | ... | 120 | do do |
| Langton Nessie | do | 3,875.00 | 134.33 | 280 | M. Inge, Sinoia |
| Langton June | do | 4,295.00 | 151.93 | 255 | do do |
| Langton Daisy | do | 3,238.00 | 138.25 | 207 | do do |
| Palm Tree Violet | do | 2,070.00 | 71.93 | 98 | do do |
| Palm Tree Buttercup | do | 2,071.00 | 67.75 | 91 | do do |
| De Grendel Bessie Burger | do | 6,381.25 | 210 53 | 137 | Government Farm, Gwebi |
| De Grendel Stienser | do | 3,528.00 | 108.26 | 70 | do do |
| Wit Fancy ... | do | 9,623.00 | 301.72 | 393 | do do |
| Mimosa Pel Clara II. | do | 11,680.75 | 364.98 | 336 | do do |
| Melrose Corrie... | do | 10,883.25 | 398.48 | 276 | do do |
| Melrose Roosje | do | 7,591.75 | 208.39 | 212 | do do |
| Melrose Maandag | do | 6,106.25 | 220.08 | 161 | do do |
| Melrose Hetta | do | 2,094.00 | 73.37 | 33 | do do |
| Mimosa Clara X. | do | 14,268.00 | 429 85 | 238 | do do |
| Mimosa Pel Stienser | do | 363.00 | 12.37 | 14 | do do |
| Madge of Batavia | do | 2,703.50 | 107.23 | 112 | do do |
| Gwebi Laura ... | do | 5,285.00 | 185.79 | 182 | do do |
| Allie ... | do | 7,311.25 | 220.77 | 161 | do do |
| Flora of Elsmore | do | 3,264.50 | 92.87 | 61 | do do |
| Roodebloem ... | Grade Friesland | 4,590.25 | 131.44 | 168 | do do |
| Waterbloem ... | do | 8,065.25 | 229.79 | 158 | do do |
| Clara ... | do | 4,164.50 | 163.18 | 78 | do do |
| Gwebi Gay ... | do | 2,524.50 | 93.37 | 80 | do do |
| Gwebi Elsie ... | do | 8,869.25 | 285.69 | 193 | do do |
| Gladys ... | do | 10,196.00 | 311.62 | 231 | do do |
| Isa ... | do | 6,582.00 | 216 35 | 127 | do do |
| Janie ... | do | 2,886.50 | 103.31 | 77 | do do |
| Fanny ... | do | 1,765.00 | 59.60 | 31 | do do |
| Katie ... | do | 1,430.50 | 32 76 | 28 | do do |
| Gwebi Princess | do | 1,113.50 | 43.42 | 28 | do do |
| Lucy ... | do | 364.50 | 12.02 | 12 | do do |

# Farming Calendar.

## April.

### BEE-KEEPING.

Where numbers of the bee-louse are seen attaching themselves to the legs of bees and also among the quilts which cover the frames, this pest can be controlled by crushing them with the finger. In the cooler districts, crates that are partially filled with honey should be removed, and into the lift which they occupied plenty of warm clothing should be snugly packed.

### CITRUS FRUITS.

During the first half of this month, autumn budding can still be performed if the sap is still up and the bark of the stock slips freely. Unprofitable and off type trees that have been headed back for top working and which have been carefully thinned out may have the shoots on which February-March buds have failed re-budded to profitable varieties. If the March rains have been sufficient and ploughing and cultivation have been completed, continue cultivation to retain soil moisture and destroy winter weeds. If a dry March has been experienced and cultivation has been badly performed, irrigation should be commenced or continued to keep the trees and fruit in good order. If not already applied to the unthrifty trees which are late with their autumn flush, soluble fertilisers containing nitrogen and phosphoric oxide can be applied with advantage to these trees. The fertiliser should be worked into the soil with a cultivator and followed up with an irrigation. Exporters should have everything in readiness for packing the early fruit, which should be fit to market about the end of the month. Scale infested fruit will be unfit for export unless treated at once. See entomological notes for treatment.

### CROPS.

If sufficiently mature, begin cutting and stooking early maize over a small acreage and plough up the ground whilst still damp between the rows of stooks. If ripe, reap and husk early planted maize, and keep in a separate dump. Continue to make field selections of the best maize plants, and mark those required for seed with strips of coloured cloth. Lift any ground nuts and potatoes showing signs of making second growth. Make silage; cut maize for this when the ears are in the "dough" stage. Pick up and stook maize plants blown over to protect the ears from white ants. Feed sweet potato vines to stock, reserving any new growth of vines for feeding as grazing in May. Plough in any green manure crops not already turned under. Plough fallowed land. Keep potatoes reserved for seed on racks in a cool place protected from frost, but well ventilated. Transplant onions from seed-beds to irrigated or naturally moist lands; irrigate about once a week, but do not apply too much water. Pick over potatoes which may be lifted, and remove the bad and diseased ones. Winter cereal crops for grain can be sown towards the end of the month. Cart manure to the lands. Remember that good and deep ploughing to a depth of at least 7 to 8 inches is essential, and the basis of all successful arable farming. If the lands are not already ploughed so deep, increase the depth of ploughing about an inch a year until this depth, or even more,

is reached. On lands which have been ploughed for a number of years at the same depth, use a grubber to stir up the sub-soil without lifting it to the surface. Too much attention cannot be paid to good tillage. It is usually good practice to follow the plough at once with a harrow or other suitable implement to break down the clods before they bake hard. Continue breaking up new lands; the earlier this is done the more complete is the decomposition of the vegetable matter in the soil. When making hay of coarse legumes such as velvet and dolichos beans and cowpeas, be sure that the vines are dry before stacking. Handle the hay as little as possible to avoid loss of leaf. Thought should be given to laying in supplies of thatching grass for thatching and repairing roofs. The veld may be beginning to dry off. Consideration may be given to mowing or otherwise preparing fire lines as a preventive against veld fires.

## DAIRYING.

At this season of the year the milking kraal is generally far from clean owing to the excessive amount of mud or dust which has accumulated during the latter part of the rainy season, and in consequence farmers invariably have trouble in producng first-grade cream. Every endeavour should be made to erect a small milking shed in which four or five cows or more can be milked at a time, and every effort should be made to keep the cows clean. The udders should be wiped before milking with a clean, damp cloth, and the farmer should see that the natives' hands are washed with soap and clean water before and after each milking.

If butter is made, the cream and washing water should be put out overnight, and if the cream is churned early the following morning, very little difficulty should be experienced in obtaining a good grain and a firm body in the butter.

From this time of the year onwards, cheese making operations are usually most successful. The evening's milk should not be kept in the dairy, but should be placed outside, preferably in a bath, and covered over with butter muslin, cheese cloth or mosquito gauze netting. Care should always be exercised, however, in using evening's milk. Morning's milk plus a starter usually gives the best quality, and if a starter is used, care should be taken that it shows no signs of gasiness or off flavours.

The season of abundant green pasture is over, and the natural grazing, unless supplemented by some green food or succulent roughage, is not sufficient to maintain a full flow of milk. The most economical supplement to veld grazing at this time is maize silage, and this should be fed in liberal quantities to all milking cows and growing stock. A few pounds of concentrates in addition would also be of great benefit to the milking cows, which should not be compelled to subsist entirely on veld hay and silage.

## DECIDUOUS FRUITS.

If not already done, orchards should be ploughed, harrowed and well cultivated to retain the soil moisture for spring blossoming and growth. Varieties such as the Chinese peaches, etc., may be pruned after the leaves have dropped.

Order all trees for winter planting during June-July. August planting is unsafe for many early growing varieties of fruits.

All late apples should be harvested and stored or marketed.

## ENTOMOLOGICAL.

Maize.—Although certain pests, such as earworm and stalk borer, may be in evidence, there are practically no operations against insect pests that can be carried out economically during this month.

Tobacco.—Any remaining plants showing stem borer attack should be removed and burnt. Watch should be kept for emergence of the adult wir worm beetle. These should be poisoned with Paris green in the proportion of

1 lb. to 200 lbs. of maize meal. The bait should be spread on the land in small heaps early in the morning and shaded from the sun.

Cotton.—Damage to bolls from bollworms may be betrayed by the dropping of the bolls attacked. These should be collected and burnt. Cotton stainers should be destroyed by hand collecting. Guinea fowl, turkeys, etc., may be encouraged about the land to destroy stainers and other insects.

Citrus.—Collect and destroy infested fruit to keep down citrus codling moth. Red scale should be destroyed by fumigation with hydrocyanic acid gas. Soft brown scale may be controlled by spraying with resin wash. If unseasonable young growth appears, aphis may develop and must be kept suppressed to prevent soiling of the fruit with black fungus.

Vegetable Garden.—Plants of the cabbage family are liable to suffer severely from cabbage louse and Bagrada bug. The former can be kept largely suppressed by frequent washings with a strong spray of cold water. Bagrada bug is difficult to fight, but carbolic emulsion and resin wash have been recommended as sprays elsewhere. These washes must be applied directly to the insects, and the immature stages are more readily killed than the adults.

Potatoes should be cultivated systematically and hilled to keep the tuber moth from the tubers.

## FLOWER GARDEN.

The garden can generally be depended upon to make a good show in the autumn and early winter, provided that the plants have been previously kept in a healthy condition by watering, mulching and feeding. Snap dragons and other seedlings, also cuttings, may now be planted out into their permanent positions. Sowing may be made of hardy annuals, such as hollyhocks, larkspur, clarkia, pansy, petunia, sweet peas, gaillardia and candytuft. Bulbs of spring flowering plants may be taken up, divided and replanted.

## VEGETABLE GARDEN.

Sow at once all that is required to fill up the vegetable garden before the soil has parted with all moisture. Seeds sown now will germinate freely, and plants will establish themselves more quickly than during the colder weather, which can soon be expected. A start should now be made at cleaning asparagus beds. This is a most popular vegetable, and yet one rarely sees it cultivated in the ordinary Rhodesian garden. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed vegetables in the whole garden. Depth of good soil and plenty of manure are all that this plant requires. Rhubarb roots may be taken up, divided and replanted this month. Plant out from seed beds cabbage and onion plants into their permanent quarters. Sow a full crop of peas, broad beans, turnips, onions, lettuce and radish.

## FORESTRY.

Cultivate the soil in the young plantations either by means of machines or hand labour. The cultivation will conserve moisture. Hoed out weed growth should be applied as a mulch round the base of each young tree. Be careful not to pile earth round the stems of the young trees. Covering the stems with earth even for an inch or two interferes with sap circulation and invites attacks by termites.

Prune the young trees to single stems. Any strong undesirable branch growth may be checked by breaking off the leading shoot.

## POULTRY.

The first chicks should now be out, and these, having been hatched, must be well looked after. No food should be given for the first 36 to 48 hours. Leave them to sleep as much as possible. See that they have plenty of fresh warm air, but are not exposed to draughts. After 48 hours

give some small grit and charcoal to purify the intestinal tract and aid digestion. A pamphlet dealing very fully with incubation and rearing of chickens can be obtained gratis on application to the Poultry Experts, Department of Agriculture.

One comes across many cases of wrong treatment of chickens in this country, the chief being uncleanliness, over-crowding, giving food too early and dirty drinking water. Two most important foods are animal protein, especially in the form of thick separated or whole milk and green food, especially onions or eschalots or their green tops. The loss in the rearing of chicks is very great; this should not be so if good breeding stock is used, the eggs from these are carefully handled and incubated and the chicks reared with care and common sense.

Any turkey chicks hatched at this time of the year should be well looked after. They should be kept warm, dry, free from insects, fed on dry food only, given plenty of thick separated milk, onions or onion tops, dry mash and grain. A pamphlet on turkeys and turkey rearing is obtainable gratis from the Poultry Experts.

Ducks should do well during the month, the weather being as a rule cool, moist and bracing; but the houses in which they sleep must not be damp. Duck breeders should always be on the "qui vive" for a round worm called "Trichosoma contortum," which is often fatal to ducks. It is found in the œsophagus, and causes arrest of growth, emaciation and weakness and sometimes epileptiform attacks. A swelling will be noticed at the lower part of the neck, which rapidly increases in size, and death occurs in one to three days. Onions, or preferably garlic, mixed with the food is a good preventive and cure. Another good remedy is essence of turpentine mixed with twice its quantity of olive oil and one or two tablespoonfuls given for a dose.

### TOBACCO.

The grading of the brighter grades should be proceeded with as soon as convenient. All leaf which has cured green should be bulked separately and be regularly examined to avoid serious damage through overheating. Tobacco seed heads, when mature, should be removed from the plants and stored where no damage will occur through activities by rats and mice. Care should be taken to store these seed heads with the pods uppermost, as otherwise much seed may be lost. Clear and plough the land soon after the crop has been harvested. Burn old stalks as a control measure against possible carry over of disease.

## May.

### BEE-KEEPING.

Last month under normal conditions should have seen the last honey flow of the season almost ready for robbing, for which purpose have the extractor overhauled, spare crates available, bee escape boards ready, honey jars and bottles ready for usage, and also have a few spare quilts on hand. Do not rob the bees of too much honey, remembering that sending them into winter quarters with a sufficiency of food means a strong issuing colony in the spring. Any new swarms that it may be decided to add to the apiary, feed well if necessary, to induce stimulative breeding while there is time, or if new young queens have replaced older ones also feed liberally this month in the proportion of one part of cane sugar to two of water; for the somewhat wild Rhodesian bee there is nothing like the Alexander feeder let in from the back. Keep all the spaces under hive

stands clean, also inspect daily to see that white ants are not building up from the soil; if this is neglected much loss may follow. When seen, sprinkle diluted kerol from a watering can under the hive stand.

## CITRUS FRUITS.

The harvesting of the early ripening fruit should be commenced about the first week in May. Exporters should cure their Washington Navels for a longer period than usual; this will enable them to detect the thick skinned fruit easily.

Where necessary, irrigation should be continued up to within ten days of harvesting.

All ploughing and cultivation should be completed without delay.

## CROPS.

Continue to cut and stook maize as it matures; make the stooks small to assist drying. Later in the season the stooks may be made larger. See that the stooks are secure and pick up plants lying on the ground. Continne to plough up land between stooks of maize. Give all maize harvested, whether husked or in the husk, a chance to dry out before riding to the dumps. Do not begin shelling if the ears are still damp. Do not use new grain bags for harvesting maize. Make the dumps of unhusked ears as small as possible; the smaller the dump the quicker the grain will dry out. Grain on the cobs dries extremely slowly, if at all, in dumps of large size. Do not mix unhusked ears from the stooks with dryer ears harvested later from the standing crop. Keep the dryer ears in a separate dump; shell, bag and stack such maize separately. When cutting maize for stooking, insist on the stalks being cut within 2 to 4 inches of ground level. The plough, in Rhodesia, will not bury roots with stalks 8 to 12 inches high. A long stubble of stalks makes clearing of the ground for ploughing very tedious and expensive. If not already harvested, ground nuts should be lifted before the first frosts damage the hay. Finish transplanting onions from seed-beds. If plants are not flourishing after transplanting, give a light dressing of nitrate of soda—50 lbs. per acre. Repeat in a fortnight if needed. Sow most winter cereals on wet vleis or under irrigation early this month. Feed your sweet potato vines to stock; if frosts occur the vines will be killed. Dig and feed tubers from end of month onwards. Towards end of month harvest cattle pumpkins and melons and handle carefully; avoid bruising to prevent rotting. Place pumpkins and melons in a dry situation in the open and in a single layer. Supply plenty of roughage to cattle pens, kraals and stables to increase the manure supply. Collect and cart manure to lands for spreading. Do not attempt to plough in dry grass or quantities of maize refuse. The plough will not turn it under and it will not rot before next planting season. Burn such refuse and make a good job of the ploughing. If the weather seems set fair, commence brick-making. A small kiln of bricks always on hand is most useful. As labour permits, re-thatch buildings and outhouses in need of repair. Overhaul, grease and paint planters, drills and other implements not required again until next season, and store away under cover. Think about your fertiliser requirements for next season and place your orders. From now onwards the second ploughing of new land broken up earlier in the season should be pushed on with as opportunity offers.

## DECIDUOUS FRUITS.

The pruning of early ripening peaches should be performed this month.

All holes should be completed and kept in readiness for June planting.

Ploughing or digging and cultivation should be completed without delay.

## ENTOMOLOGICAL.

Cabbage Family.—Plants of this family are liable to suffer greatly from cabbage louse and Bagrada bug during May. For the former, spray with soap and tobacco wash, which may help if the plants are not too big.

**Dhal.**—Blister beetles are still injurious to the blossom of the crop, and should be regularly collected and destroyed.

**Citrus Trees.**—Continue to collect and destroy all fruits infested with citrus codling.

**Guava.**—Fruit fly and citrus codling breed in these fruits during the autumn and winter.

Tobacco.—Watch should be kept for emergence of the adult wireworm beetle. These should be poisoned with Paris green in the proportion of 1 lb. to 200 lbs. of maize meal. The bait should be spread on the land in small heaps early in the morning, and shaded from the sun.

## FLOWER GARDEN.

The month of May is a suitable one for the preparation of new flower beds. The ground should be well trenched, and if of poor quality, a light dressing of well rotted manure will be a distinct advantage. Too heavy dressing is not advised, as too rich a soil is likely to produce an abundance of foliage and very few flowers. It is not too late to sow sweet pea seeds, but the best results come from early planting. By this time all bulbs for spring flowering will be planted. Chrysanthemums, delphiniums, dahlias and other herbaceous perennials may now be cut down, and if necessary taken up, divided and replanted

## VEGETABLE GARDEN.

It will be necessary during the early part of the month to clear off what remains of summer crops, such as haricot beans, peas, cucumbers, etc. Where winter deep rooting vegetables are to be grown, such as carrots, parsnips and beets, the soil and sub-soil should be deeply worked, so as to allow a ready root run for these vegetables. A dressing of lime will be of great value in every section of the kitchen garden. This will especially help to minimise future attacks of insects and fungus attacks. New asparagus beds may be made this month; old beds should be cut down, cleaned and kept in good order; also a light dressing of stable manure may be given to the beds. Planting may be made of all seedlings, such as cabbage, cauliflower, lettuce, onions, etc., and seeds of carrot, leek, lettuce, onions, peas, radish, turnip, parsnip, broad beans may be sown.

## FORESTRY.

Continue pricking out seedlings into tins. Deciduous trees which are propagated by means of cuttings should be taken in hand.

See that the fire lines are in order, and in the case of woods which have formed canopy, remove inflammable material below the edge trees.

Place orders for any trees proposed to be planted during the ensuing season, so that nurserymen may make provision.

## POULTRY.

All cockerel chickens should be separated from the pullets, and every month be gone over carefully, the poorer ones eliminated and only the very best kept. Those cockerels with the deep long bodies, short legs and round heads should be kept. Those with any inclination to long legs, knock knees, long heads or thin beak, lop-over combs, narrow bodies, or those lacking length and depth should be rigorously discarded. The chickens must not be allowed to become chilled, especially at night; on the other hand, they must not sleep in a hot stuffy atmosphere. On no account must they be overcrowded; this is fatal and is one of the many rocks on which poultry keepers come to grief.

The young stock must have all they can eat; to stint them is to ruin them for good and all. A bird that has been stunted never recovers. Remember that they require food for heat, energy, repair of wear and tear, and to produce bone, fat, flesh, tissue, blood and feathers. A good quality bone meal (lime phosphate) is absolutely necessary, as is also plenty of succulent green food, and no animal protein is better than thick separated milk for the health and growth of the chickens.

Those going in for ducks should hatch according to the numbers they have to supply for eating each week. Ducks must have all the food they will eat from the time they are hatched. A quick-growing duck should put on 1 lb. per week and be ready for killing at from seven to eight weeks old. Always kill or sell for killing just before the large wing feathers commence to grow.

If the rains have stopped, turkeys can be hatched. See that the youngsters are kept warm, but also that they have plenty of fresh air. Never feed young turkeys on wet or moist food, but give dry mash, grain, plenty of onion tops or onions chopped small, and thick separated milk. Keep them free from insect vermin; they will never thrive if they are infested with these.

Never allow the hen that has hatched the turkey eggs to run with the youngsters. Always confine her in a coop, through the slats of which the young turkeys can run in and out. The coop should be moved to fresh ground each day; nothing is worse for young turkeys than to be running on the same piece of ground for long at a time. Tainted ground is one of the chief causes of mortality among young turkeys.

## STOCK.

Cattle.—Ranching cattle may still be expected to be in good condition. In most districts it will be wise to conserve hay, maize stover, ensilage and a supply of any other cheap feed as a provision against possible late rains in the spring, and to enable one to maintain the younger or very old stock should occasion arise. By the middle of this month dairy cattle will require more serious attention in the matter of feed. Grass should be cut for bedding and both cows and calves should be well bedded down at night from now onwards, and cowsheds should be put in good repair. Attention should be given to the water supplies and care taken that they are clean and sufficient.

Sheep.—If the vleis have dried, sheep may be allowed into the lower lying veld. If the rams are put in now, lambs will arrive in October, which is usually a good month to arrange for. Those who favour winter lambs and have ewes lambing now will find a few handfuls of maize, together with chopped maize stalks or any other kind of available roughage or green stuff, a great help to the ewes in providing milk.

## TOBACCO.

Curing should be completed as early in the month as possible to prevent loss from frost. The bales of tobacco should be examined and turned weekly until they are despatched from the farm.

All bulks must be inspected regularly and turned if necessary. Tobacco seed should be shelled as soon as the seed pods are dry and the seed carefully labelled and stored in a dry place.

The stumping, clearing and ploughing of new land, if operations have not already been commenced, should be no longer delayed. Land which has just produced a crop should be ploughed and harrowed as soon after the harvest as possible.

## VETERINARY.

Horse-sickness will still be in evidence, and may be expected to continue until the frosts occur. Inoculation for blue tongue should be performed in the dry season only, unless the animals can be kept under cover for 21 days. Do not inoculate ewes in lamb on account of abortion. Inoculated animals spread the disease for 21 days. Scab is a poverty winter disease.

## WEATHER.

During the major portion of this month the ordinary winter conditions prevail, viz., cloudless sunny days and cold nights. Frost may be normally expected at any time during the latter half of the month. There is often, however, a recrudescence of rain conditions during the early portion of the month, resulting in overcast days and light drizzling showers, the normal rainfall at many places, particularly in the southern and eastern portions of the country, amounting to over half an inch.

# Departmental Bulletins.

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## AGRICULTURE AND CROPS.

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Farmers' Day at Matopos, 19th March, 1929

THE RHODESIA

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## Editorial.

*Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:— The Editor, Department of Agriculture, Salisbury.*

**Farmers' Days.**—We publish elsewhere in this issue of the Journal reports of the Farmers' Days which have been held recently at the Government farms at Matopo and Gwebi, and the Municipal farms at Gwelo. Similar reports to those we now publish, though briefer, have appeared in the public press, but it is thought that it would be helpful to farmers if these reports were brought together and published as a complete article. The reports are necessarily lacking in detail, as a full account of all that happened would nearly fill this Journal, but a broad outline is given of the principal events of the day, and will, we trust, indicate the work which is in progress at the farms visited. It may be that these accounts will induce those who were unable to be present to come and see for themselves next year how these farms are worked; if so, they will have served a useful purpose.

It is gratifying to note by the attendances that these Farmers' Days are increasing in popularity, and we trust that those who attended will pass their observations on to others. The methods employed at the farms are nothing but the practical application of the teachings of the Department of Agriculture, and the results viewed were evidence of the soundness of these teachings. It is not suggested that these methods should be slavishly followed in all circumstances, for it may be necessary to modify them to meet particular conditions; but as a general guide for good farming the systems undoubtedly provide a valuable object lesson.

It was very pleasing to note the interest manifested by visitors in all that was shown them, and the close attention given to the various lecturers. There was an evident desire to analyse the various systems of farm management in vogue, and judging from the numerous questions fired at the different demonstrators, much useful information was assimilated.

There is no doubt that those who attended spent a most instructive day, and we feel that these occasions have a distinct use in enabling the Department to maintain that close contact with the farmers which is necessary for the advancement of the agricultural industry.

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**Diplodia in Maize.**—The dry rot of maize cobs caused by the fungus *Diplodia zeæ*, usually known locally as Diplodia, has been receiving the attention of the division of Botany and Mycology for some time, but detailed work upon the disease has not been possible until recently. A survey of the amount and distribution of Diplodia, together with an investigation of losses which it causes, has been commenced, and it is now evident that the position in Southern Rhodesia approximates to that in certain areas of the American maize belt. There seems to be little doubt that the intensity of infection varies with climatic conditions, a heavy rainfall favouring the development of disease. It is possible that a reduction in yield of as much as 25 per cent. may be experienced in an unfavourable season, whilst 10 to 15 per cent. is a conservative estimate of the average annual loss. Of the seriousness of the disease there is no doubt, but there does not appear to be any insurmountable obstacle to its efficient control by

methods which will be recommended later. It was intended to include an article by the Chief Botanist and Mycologist in this issue of the Journal dealing fully with Diplodia, but pressure of work in other directions has made it necessary to postpone its publication until the June number. One point, however, needs to be stressed now, and that is the danger of selecting for seed any cobs which show the smallest trace of mouldy growth. Seed cobs should be removed as soon as possible from the stooks, or, better still, reaped before the main crop is stooked, and stored separately.

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**Wheat.**—We publish in this issue of the Journal the concluding portion of the article on wheat, which first appeared last month. The article has created considerable interest and the hope has been freely expressed that it will be possible to evolve a wheat of good cropping capacity that can be grown as a summer crop and will meet the requirements of the millers. In regard to this latter point, we might supplement what is contained in the article on the subject of "strength" by summarising the remarks contained in a report issued by the Ministry of Agriculture and Fisheries on the marketing of wheat, barley and oats in England and Wales. The term "strength" is sometimes applied indiscriminately to either wheat or flour. When applied to wheat, it means one which yields a "strong" flour. When applied to flour, it means the capacity of the flour (1) to absorb and retain moisture, and thereby yield a large number of loaves to every sack of flour, and (2) to produce loaves of a large size and of good shape and texture. It should be possible to rely on a "strong" wheat flour to give these results consistently in spite of fairly wide differences in baking practice. There is no direct relation between gluten content and strength, for the gluten of wheat is not one substance but a mixture of several. Further, gluten is a colloid, and, as such, is profoundly influenced by its surroundings. Flours containing similar amounts and similar types of gluten may, therefore, behave quite differently in the process of baking, owing to variations in the relative concentrations of acids and salts surrounding, and intimately associated with, the gluten. Largely for this reason chemical substances ("improvers")

are frequently added to flour in order to modify the environment of the gluten and so influence its behaviour in baking.

The power of absorbing water may vary considerably as between a strong and a weak flour. This difference is worth money. Although flour absorbs a large and varying quantity of water, the deciding factor is, of course, the amount finally retained in the bread. It has been cynically remarked that a baker's function in life is to make water stand upright. Jago, in "Technology of Breadmaking," gives the moisture content of the best white bread as 38.35 per cent.; shop bread, baked from "London Household" flour, as 40 per cent., and wholemeal bread as 44.56 per cent.

The report cites a well-known miller who, in the course of 35 years' experience, stated that he found that bakers seldom question or complain regarding the colour or chemical composition of his flour, or criticise the texture or flavour of the bread it produces; practically the only question they ever ask is: "How many loaves can I get to the sack?" Bread-yield is, in fact, the baker's touchstone; to him, low yield and low quality are synonymous terms. Yields of over 100 4 lb. loaves per sack of 280 lbs. are not uncommon.

At the time of writing the plots of wheat at the Agricultural Experiment Station, Salisbury, are being reaped, and we hope to be able to make a few comments in our next issue as to the behaviour of some of the varieties under trial.

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**United States Tobacco Trade for 1928.**—A very comprehensive review of the United States tobacco trade for 1928 appeared in the American trade journal *Tobacco* for 21st February. It is stated that the year 1928 marks one of the greatest years in the history of the American tobacco trade. The total exports of leaf tobacco during the year climbed to nearly 584,000,000 lbs., which is the highest export point ever reached in the history of the industry, except in 1919, when a tremendous surplus occasioned by the World War was moved; in that year leaf exports reached approximately 777,000,000 lbs.

More than $154,000,000 were brought into the United States from foreign countries as a result of the total leaf

export trade in 1928, compared with $140,000,000 in 1927, but the average export value per pound was a little less, amounting to 26.8 cents in 1928 and 27.5 cents in 1927. There has been a decline of about one cent per pound in the total export leaf value every year for the past three years.

The most outstanding feature of the leaf export trade of 1928 is the decided shift in markets from Europe to Asia. From the beginning of the American tobacco industry Europe has been the paramount tobacco market, and while that position is still maintained, it exists as such on a much smaller margin. European tobacco markets are declining; Asiatic markets are increasing.

The two continents take, on an average, over 90 per cent. of the total leaf exports from the United States. Export proportions in 1927 were 72 per cent. to Europe and 19 per cent. to Asia, while the proportion in 1928 was 54 per cent. to Europe and 38 per cent. to Asia. From a standpoint of market strength as buyers of American tobacco, the United Kingdom dominates Europe and China dominates Asia. It is a notable fact that every European tobacco market of importance declined in 1928, as compared with 1927, and every Asiatic market of importance increased.

Total leaf exports to the United Kingdom in 1928 amounted to 173,667,000 lbs., a decrease of 5 per cent. compared with 1927, but an increase of 16 per cent. compared with 1926. Other important leaf markets of Europe showing declines in 1928 were France, Germany, Netherlands, Spain and Belgium. Even the minor markets of Europe have declined sharply; Poland and Danzig, the Scandinavian group, Switzerland and Portugal all show disintegration.

On the other hand, leaf exports to Asiatic markets in 1928 were characterised by an increase of 128 per cent. compared with 1927, and 70 per cent. compared with 1926. Exports to China increased by 212 per cent.; to Australia, 7 per cent.; to Japan, 53 per cent.; to Java and Madura, 27 per cent.; and to British India, 68 per cent.

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**The Beef Trade of the United States.**—The position of the beef trade in the United States of America continues to

be a subject of absorbing interest to distributors of meat in Great Britain and also to the meat producers in the Empire. The growing scarcity of cattle in the United States and the possibility of the removal of the embargo against Argentine cattle owing to the prevalence of foot and mouth disease in that country, are factors of profound significance to those concerned. The "Eat less beef" campaign in numerous population centres in the United States and the endeavour to induce the people to eat more mutton and lamb are evidences that a serious position has arisen. As we pointed out in a recent issue of this Journal, if the United States were to take only 5 per cent. of its meat supply from Argentina, that would reduce by one-third the total amount of Argentine meat which would be available for export to Great Britain. Seeing that nearly 700,000 tons of Argentine beef are annually consumed in Great Britain, the significance of any such shortage is clearly apparent.

The United States is to-day obtaining large quantities of beef from outside her borders, the principal sources of supply being Mexico and Canada, from whence during the 11 months of 1928, 493,656 cattle and calves were imported, compared with 385,670 during the corresponding period in 1927. New Zealand is now participating in this trade despite the duty, and during the first eleven months of 1928 sent 30,167,000 lbs. of beef and veal to the United States. The magnitude of the beef trade of the latter country will be realised from the fact that the number of cattle slaughtered in 1928 was 13,000,000.

Recent figures of the marketings of cattle in the principal markets of the United States in 1928 show that cattle receipts were nearly three quarters of a million head less than those of 1927, and two and a half millions head less than in 1926. At some of the principal markets those receipts were the lightest in thirteen years or more. In the Agricultural Outlook for 1929, compiled by the Bureau of Economics of the United States Department of Agriculture, it is stated that a further reduction of market supplies is expected in 1929, although the decrease probably will not be as great as in 1928.

The high prices now ruling for beef in the United States will undoubtedly lead to greater internal production, although to what extent it is possible for the supply to be increased is

not clear. The number of all cattle on 1st January, 1929, was estimated by the Department of Agriculture at 55,751,000 head, which is 70,000 head or 0.1 per cent. more than on 1st January, 1928. The total on the latter date was, however, the lowest since 1912. It is stated that this small change during 1928 indicated that births and imports during the year were about equivalent to total slaughter and death losses. According to department estimates, there was an increase of about 3 per cent. in the number of cattle on feed in the Corn Belt on 1st January, compared with 1st January, 1928, which was partly offset by a decrease in the Western States.

The position is fraught with great possibilities for the cattle producers of the Empire, and it would be well for us in this Colony to watch the portents carefully.

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**Irrigation Development in Matabeleland.**—With a view to fostering irrigation development in Matabeleland and the more arid portions of Southern Mashonaland, it has been decided to appoint an Irrigation Engineer for advisory work in this area, with headquarters at Bulawayo. Mr. P. H. Haviland, B.Sc., A.M.I.C.E., of the Department of Agriculture, who is well known throughout the Colony for his advocacy of soil erosion protection measures, has been selected for this appointment and will assume duties in Bulawayo early in June.

It is considered that the future of agriculture in Matabeleland particularly is governed by the provision of economic and adequate water supplies, both for stock and irrigation purposes.

The constitution of a special branch of the irrigation office in Bulawayo will enable the peculiar conditions in the drier areas of the Colony to be more adequately studied and advisory tours through the various districts more readily undertaken than would be possible from Salisbury headquarters. The area embraced by this office will be the whole of Matabeleland up to Gwelo and the Victoria, Chibi and Ndanga districts in Mashonaland. The advice obtainable from the office will consist of the following:—

(a) Erosion prevention measures, such as contour furrows and contour ridging, which, while preventing erosion of the lands, also temporarily check storm run-off and therefore cause more water to be absorbed by the soil, and thus ultimately improve underground water supplies.

(b) The construction of small storage works suitable for providing for the watering of stock, and which also afford protection against erosion.

These works include small earthen storage dams, wire and stone bolsters in spruits, dongas and depressions. Earth dams of limited storage capacity can be constructed by the farmer himself at comparatively cheap cost, provided he has had the necessary engineering advice.

Stone bolsters enclosed in wire netting with earth or clay backing can be cheaply and simply constructed across spruits and dongas and are mainly useful for holding up silt, and thus prevent undue erosion, with subsequent lowering of the underground water table. A succession of stone bolsters along a stream tends to create a perennial flow in the lower reaches of the stream and thus materially improve the general conditions.

(c) The construction of low weirs with movable shutters on the larger-sized rivers, which will enable the storage of water at the end of the wet season after the silt-laden flood water has passed.

(d) The construction of larger-sized flood storage works to provide for a limited amount of irrigation to summer crops during partial drought periods or for the irrigation of winter crops.

Reconnaissance surveys of the larger-sized rivers will also be made in order to determine the location of suitable sites for these larger-sized works. A survey of this nature is at the present time being carried out along the Tegwani River.

Any farmer who wishes to avail himself of the services of the engineer after the 1st June should communicate with the Irrigation Engineer, P.O. Box 566, Bulawayo.

# Fruit Growing in Southern Rhodesia.

## THE HOME ORCHARD.

By G. W. MARSHALL, Horticulturist.

**Introduction.**—In this article it is proposed to deal mainly with the general purpose or utility orchard for the farm or town plot in which the owner wishes to plant a selection of fruit trees to meet the household's fruit requirements.

Fruit may be regarded as an essential part of our diet, and if we wish to maintain good health an endeavour should be made to produce throughout the year a regular supply of fruit. This is possible in many districts of Rhodesia, for we have a wide range comprising tropical, sub-tropical and temperate fruits to choose from, and with judicious selection a sequence of fruits may be produced to furnish the home' requirements from January to December.

A comparison of existing home orchards in Rhodesia is enlightening. They vary from exceptionally good to extremely poor. In the former case there is evidence of a natural love for orchard management, the trees are well tended, the fruit crops are good in quality and quantity and are a real joy to the owner. In other orchards are trees planted carelessly, neglected and an eyesore to all who see them. Many of these failures are due to lack of knowledge concerning the planting and subsequent cultural requirements of the trees, to planting of varieties unsuitable for the purpose they were intended to fulfil or to the planting of more trees than were actually required or could properly be attended to.

An endeavour will be made in the succeeding pages to deal with the many factors that need consideration when establishing and maintaining a home orchard, and it is trusted that the advice tendered will be of assistance to those about to establish, extend or improve their orchards.

**Selection of the Orchard Site.**—The most important factors to consider when selecting a site for a home orchard are suitability in respect to—

(1) soil;
(2) shelter;
(3) aspect;
(4) irrigation possibilities; and
(5) distance from homestead.

If one or more of these factors are disregarded, poor and unprofitable fruit may very well be the result.

**Soil.**—The best soil for the profitable production of most fruits is a light to medium loam with good depth and drainage. Suitable soils as described above will furnish the trees with a large root-feeding area, the trees will be capable of growing to a good size, living to a great age and producing large crops of good fruit. If there is no soil of this nature available it then becomes necessary to be content with a heavier soil. Heavy soils, however, are undesirable; they are more difficult to work, and the quality of the fruit they produce is often poor, particularly during wet seasons, and they should be avoided if lighter soils are available.

On shallow soils with impervious sub-soils young trees may thrive and flourish for a few years, but when the roots encounter the objectionable sub-soil the trees will rapidly decline or die and prove a great disappointment to the owner.

The minimum depth of a good fruit tree soil should be not less than four feet, and to this depth the land should be naturally well drained. Soils containing small stones throughout their entire depth or those overlying gravelly sub-soils are suitable for tree-planting, provided the tree roots are able to penetrate to the requisite depth, namely, four feet or more.

**Shelter.**—Owing to the harmful effect of dry winds during spring or the blossoming months upon the setting of

the fruit, it is imperative that all orchards should be adequately protected from such winds. Having selected a suitable soil for the orchard, shelter belts, unless already existing naturally, should be established without delay. It is to the advantage of the fruit trees if shelter belts which are required to be established are planted a few years in advance of the orchard they are to protect.

Young fruit trees require protection from time of first planting if the best results are to be assured. This is not always feasible, however, particularly with new arrivals to the country who desire to establish orchards without unnecessary delay. In instances such as this the shelter trees should not be planted later than the fruit trees they are to protect, and meanwhile rows of some of the more quick-growing temporary shelter plants may be grown at close intervals around and through the orchard to afford temporary protection until the permanent trees become effective.

When the orchard is enclosed, as it should be, by wire netting or fencing to exclude domestic animals, small buck and ground vermin, a temporary shelter can quickly be produced by planting granadilla vines at ten feet intervals along the fences; when the vines have covered the fence a few additional strands of wire may be erected above to enable the vines to form a screen of at least six feet in height. Other creepers may be used in place of the granadilla, but the latter is preferable, as it produces an edible fruit. Bananas and plantains are useful shelter plants; they grow quickly and produce good fruit. Dhal also is useful for a temporary hedge, the foliage and grain being valuable poultry food.

The best time of year to plant all shelter trees is during the months of December and January; by planting at this season, when rains are usually frequent, it should be possible to establish the trees before the dry season commences. It is seldom necessary to plant shelter trees on more than three sides of the orchard, the idea being to exclude the prevailing hot and dry winds that are prevalent from July to November. The sides of the grove usually requiring protection are the south-east and north-west, as it is from these directions that most of the winds are experienced. If the west, south and east sides are protected, little or no tree or fruit injury will

occur. No shelter trees should be planted nearer than 60 feet to 70 feet from the fruit trees, but this distance appears to be ample for Rhodesian requirements.

The varieties of trees recommended for shelter belts are: Tall-growing trees for outer rows—*Eucalyptus tereticornis* and *Eucalyptus saligna;* the latter do best at the higher elevations. If eucalyptus trees are objected to and the soil is sufficiently light, *Pinus insignis* will be found suitable for the outer rows, and for the inner rows *Callitris calcarata*, *Callitris robusta*, *Cupressus torulosa* and *Cupressus lusitanica*, but the last-named only where the rainfall is heavy or irrigation is possible.

Many other varieties are suitable and may be planted, but those specially mentioned will furnish a sufficiently wide range to select from for average climatic conditions.

When two or more rows of trees are planted to form a shelter belt they should be spaced 8 feet apart in the rows and 10 feet between the rows. "Staggered" trees give the best results.

**Aspect.**—The best aspect to select for the orchard is one with a gentle southern and eastern slope. Northern and western aspects are often undesirable. The slope of the site should not be excessive, or soil erosion will be liable to occur during heavy rain storms or irrigation. The best slope will vary with the nature of the soil, but it should never if possible exceed one in a hundred.

**Irrigation Possibilities.**—Preference should be given to a site capable of being irrigated preferably by gravitation, provided the shelter, soil and aspect factors are right. Good fruits may be grown in Rhodesia without irrigation, but if irrigation can be made available, so much the better.

**Distance from Homestead.**—The orchard site should be as near the homestead as possible, but the other factors must not be disregarded when making the choice. Orchards distant from the homestead are more liable to be neglected, cannot be kept under such close supervision and are subject to greater losses through depredations by birds and by theft.

**Preparation of Land.**—After the selected site has been cleared of its timber, etc., it should be deeply ploughed and

brought into good tilth; this is possible if performed toward the end of the rainy season—about March. When the ground is prepared at this season most of the soil moisture will be conserved and the later operation of digging the tree holes will be made easier. When irrigation is possible it is also necessary to give careful attention to the problem of how the proposed site can best be irrigated. In such cases the advisability of grading the land before the trees are planted cannot be too strongly emphasised, as the efficiency of the irrigation scheme so much depends upon the proper grading of the site. After grading, the whole area should be re-ploughed, cultivated and brought into the best possible condition, and if it can be arranged a local irrigation should be given to ascertain which fall will be most suitable for planting the rows. The rows should preferably be short, with not more than 15 trees to each row. Such rows would be 120 yards in length and the fall should be about 6 inches per 100 feet, according to the nature of the soil; sandy soils require a greater fall than those of a medium or heavy character. When trees are planted on an ungraded soil continuous trouble will confront the grower, and as it is neither easy nor economical to grade the slopes of an established orchard, this work should be done prior to planting. The additional cost of a properly graded site is more than justified on account of the ease with which all of the cultural and irrigation operations may be performed. On ungraded slopes the trees will receive irregular supplies of water, and this in turn will necessitate more frequent irrigation. Depth of ploughing will also be uneven; silting will occur in the depressions, thereby endangering the health of many of the trees.

**Laying out the Orchard.**—After preparing the chosen site in a thorough manner it should be carefully laid out with the rows of trees planted along the contours, where necessary, allowance being made to permit of the irrigation water flowing evenly without displacement of the soil. The necessary appliances for the pegging out of the site are:—

Planting wire or strong garden line to set about six pegs at a time (42 yards). For this purpose No. 16 galvanised wire could be used, and lumps of solder or rings of wire should be connected at the distances apart it is intended to

space the trees. A 3-inch ring must be attached to each end of the line 3 feet from the end solder mark. This facilitates the adjusting of the wire to its position when the pegging operation is proceeding. Two half-inch iron pins 18 inches in length will be suitable to hold the line in position while the marker pegs are being set. Sufficient wooden pegs 12 inches to 18 inches in length and about 1 inch in diameter should be available to allow of using three pegs for each tree to be planted.

The square system is the best for the laying out of the orchard, as it facilitates all cultural operations, chiefly on account of the wider middles (space between the rows of trees). It permits of ploughing and cultivation being carried out in four directions, and each tree has a greater root-feeding area than that obtained in other systems of planting.

The procedure to adopt when pegging the site is as follows:—Set the first line of pegs parallel but at least 60 feet distant from the windbreak, provided the fall is suitable for irrigation. When the base line is completely pegged the end lines should then be set at right angles to it and then pegged. The unpegged side should next be checked to ascertain if it is the same length as the base line, and if it is found to be incorrect it will then be necessary to adjust one end line to correct the error. The fourth side may then be pegged. We now have the site completely enclosed with the outer row pegs. Presuming that a six-peg wire is being used, it will then be necessary to peg every sixth line parallel to the base line; when this is completed the filling in will be simple. The line should be set between the base line and sixth row pegs and the four intervening pegs set. This filling in is then repeated until the end of the section is reached, after which the marking wire should be set from the sixth row to the eleventh row peg and the four intervening pegs set; this filling in process is then repeated until all pegs are set.

After the area is completely pegged, and if it is intended to dig the holes at once, the whole site must be doubly pegged to permit of digging the holes where the tree pegs stood. This pegging is simple if a suitable marking board is made as illustrated in Fig. 3. The second pegging

TREE PLANTING DIAGRAM.

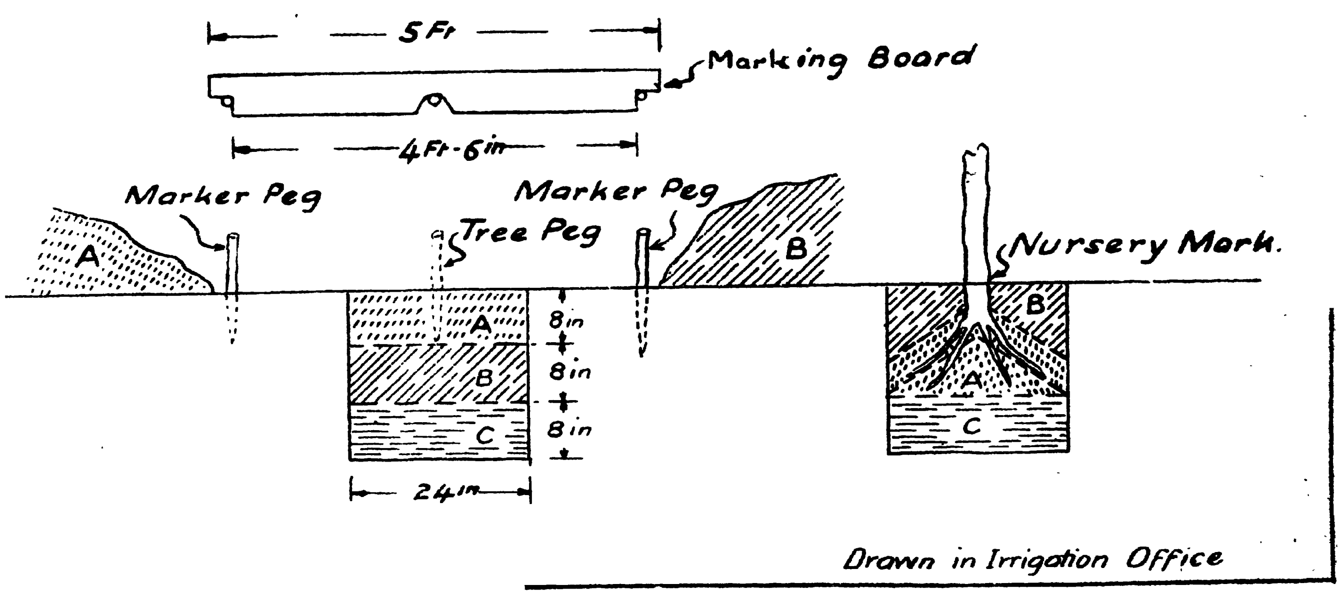



Fig. III.

may be commenced from any corner of the site and can be continued row by row until completed.

Place the central notch of the marking board close against the tree peg, then set the two marker pegs in the end notches of the board, which may then be moved to the next peg, when the process is repeated until the site is completely double pegged. The tree pegs may be left standing, as it assists the hole-digger to locate the exact spot the tree is to occupy.

**Digging the Holes.**—All tree holes should be dug if possible several weeks before the planting of the trees is begun, and when this is possible the holes should be refilled with good soil soon after digging is completed to prevent the earth settling down, and thus eliminating the danger of the trees sinking too deeply, as is often the case where trees are planted immediately after the digging of the hole. The size of the holes for the trees should be at least 2 feet *square* (not round) and 2 feet deep.

The digger must first mark the size of the hole round the tree peg before withdrawing it. He should then dig out 8 inches of surface soil and place it on a side unoccupied by a marked peg. The second 8 inches of soil is then placed on the opposite side of the hole and the bottom 8 inches of soil is loosened and left in the hole. This procedure is best for soil of good depth and quality.

If the sub-soil is inferior to that of the surface soil the first 8 inches of soil should be placed as previously suggested and the remaining 16 inches be dug out from the hole and discarded, the hole being then two-thirds refilled with good surface soil collected from near by, the 8 inches of surface soil previously taken out being used to complete filling. When hard pans are encountered it is advisable to break these with dynamite (agricultural). The explosion will shatter these hard pans to a great depth and allow roots to penetrate in all directions. When dynamite is correctly used a pot-hole will be formed where the explosion took place; this hole should be closed and firmed, otherwise trees planted above it will gradually subside and eventually stand in a deep basin. This condition is very undesirable owing to water accumulating round the stem of the tree after irrigation or rain.

Fig. I. Desirable shelter of cupressus. An outer row of tall trees would furnish better results. These trees are too near the citrus trees.

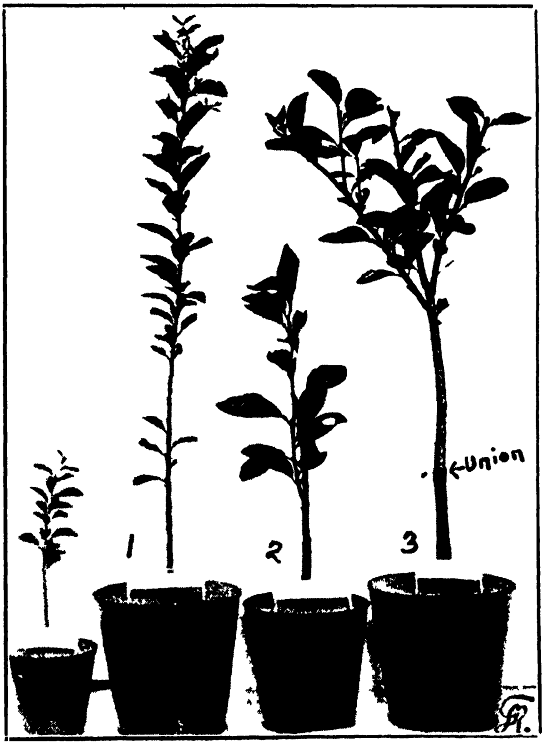



Fig. II. 1 and 2 small trees unsuitable for planting, 3 newly planted tree well headed back.

**Planting Distances.**—Most varieties of fruit trees for best results should be spaced at certain specified distances. This is possible in commercial plantings, where large numbers of a fruit variety are planted. In the home orchard it is different, as often fruit trees that require various espacements must be planted in a small area. This difficulty may be overcome by arranging the varieties in such a manner that the short-lived trees may be rooted out when their neighbours or larger-growing trees require the additional space. Suitable distances for planting fruit trees are as follows:—

| Variety. | Distance apart each way. |
|---|---|
| Pecan nut and walnut ... ... ... ... ... | 48 ft. |
| Seedling orange and seedling Avocado pear, grafted orange, lemon, naartje, Tahiti lime, grape fruit, mango, grafted Avocado pear, litchi, guava and pear ... ... ... ... ... ... ... ... ... | 24 ft. |
| Almond, quince, West Indian lime, plum, peach, apple, apricot, nectarine, fig, cherry, custard apple, persimmon ... ... ... ... ... | 20 ft. |
| Paw-paw, banana, plantain, tree tomato and Chinese guava ... | 10 ft. to 12 ft. |

It is not necessary or possible to plant the assortment stated, but it is often necessary to plant a mixture of trees requiring different espacement, which may be arranged as follows:—

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | 12 ft. | T | 12 ft. | S | 12 ft. | T | 12 ft. | N | 12 ft. | S | 12 ft. | T |
| T | | T | | T | | T | | T | | T | | T |
| S | | T | | S | | T | | S | | T | | S |
| T | | T | | T | | T | | T | | T | | T |
| C | | | | C | | | | C | | | | C |
| C | | | | C | | | | C | | | | C |

**N denotes Pecan nut trees ... ... 48 ft. apart.**
**S denotes Stone fruit trees ... ... 24 ft. apart.**
**C denotes Citrus trees ... ... ... 24 ft. apart.**
**T denotes Paw-paw trees ... ... 12 ft. apart.**

The average profitable life of these trees would approximately be : Pecan nut 100 years, stone fruit 10 years, citrus fruits up to 50 years or over, paw-paws 5 years.

From the profitable ages given it will be seen that all the T's could be removed after the fifth year, thus giving additional space for the N's and S's. The S's would then be removed at the end of the tenth year to provide the N's with sufficient space to develop fully. This system of interplanting short-lived trees between trees that grow to a large size and live to a great age is to be commended as the most satisfactory method for the lay-out of the home orchard.

**Ordering of Trees.**—When a purchase of fruit trees for planting is to be made they should be ordered well in advance of the planting season. It is best to buy the trees from reputable nurserymen who raise good and healthy trees from selected parents. First-sized trees only should be used; smaller trees are often runts and seldom give good results. Fig. 2 (3) shows a good first-sized citrus tree 12 months after budding.

**Time of Planting.**—Deciduous fruit trees should be planted when they are dormant (have shed their leaves), the best months being June and July; the latter month is somewhat late for many varieties of sub-tropical peaches, and these should, according to circumstances, be planted in June or even as early as May.

Citrus and other evergreen fruit trees may be planted at any season of the year, provided irrigation facilities are available and the trees are not in active growth. When only a few trees are to be put out, and assuming they are procurable, August is as good a month as any in which to plant. Given good attention and a full growing season, August-planted trees will out-grow those planted later in the year. For extensive plantings, however, the rainy season should be chosen, for then there is less danger of mortality amongst the plantings. January is the best month if the trees are dormant. Trees planted this month will do better than those planted later, as they are more capable of withstanding any unfavourable climatic conditions which may occur during the succeeding winter.

**Choosing Varieties to Order.**—For the home orchard it is advisable to select, as far as possible, varieties that are known to do well in the locality in which it is intended to plant. Well established nurserymen are often the best advisers in this respect, for they make a speciality of raising trees that do well in particular districts, their advice being based on repeat orders received from these areas.

Southern Rhodesia produces fruit ranging from temperate to tropical, for in the tropics high altitude gives large sections of country with a temperate climate. It is, however, advisable to plant most varieties that are known to thrive and yield fruit under sub-tropical conditions. It is also well to plant varieties to give, if possible, a sequence of fruit throughout the year. With the home orchard, owing to the greater variety of fruit trees planted, there is seldom the necessity to consider inter-pollination. When a few varieties of each fruit are planted, pollination is usually good. Fruits such as the Ohinemuri apple, Doyenne du Comice pear and most almonds are self-sterile, *i.e.*, they are incapable of pollination with their own pollen. Sometimes the male and female flowers mature at different periods and this prevents natural pollination. Walnuts also are often affected in this way. To counteract this difficulty the Ohinemuri apple tree must be planted next to the White Winter Pearmain apple, Comice pear next to the Beurre Bosc, and the Wickson plum next to Kelsey. This inter-pollination is to be considered more by the commercial planter than the home orchard, but even by the latter it should not be disregarded.

The commercial grower in the past often planted pure blocks of one or more of such varieties, with disastrous results. When these blocks of one variety were worked to two or more varieties blossoming at the same time, alternative rows having been cut down and top-worked, the trees started bearing as soon as the top-worked trees blossomed.

For the guidance of new growers, a list of suitable trees is here given for the different zones in Rhodesia:—

## Rhodesian Fruit Zones.

Zone 1.—Inyanga, Makoni, Umtali, Melsetter.
- (a) 6,000 ft.
- (b) 5,000 ft.
- (c) 4,000 ft. and under.

Zone 2.—Salisbury, Marandellas, Charter, Hartley.
- (a) 5,000 ft.
- (b) 4,000 ft. and under.

Zone 3.—Mazoe, Lomagundi.
- (a) 5,000 ft. (Umvukwes).
- (b) 4,000 ft. and under.

Zone 4.—Gwelo, Selukwe, Victoria.
- (a) 5,000 ft.
- (b) 4,000 ft. and under.

Zone 5.—Matabeleland.
- (a) 4,000-5,000 ft.
- (b) 4,000 ft. and under.

## RHODESIAN FRUIT ZONES.

X denotes "may be planted."
? denotes "doubtful."

| | Season | Zone 1 | | | Zone 2 | | Zone 3 | | Zone 4 | | Zone 5 | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | A | B | A | B | A | B | A | B | |
| **Apples.** | | | | | | | | | | | | | |
| Alma ... ... ... ... ... ... ... ... ... | E | X | X | X | X | X | X | X | X | X | X | X | Blight-proof; early, inclined to be small. |
| Blenheim Orange Pippin ... ... . | M | X | X | ... | X | ... | X | ... | X | ... | X | ... | Good mid-season; subject to bitter-pit. |
| Christmas ... ... ... ... .. ... ... | E | X | X | X | X | X | X | X | X | X | X | X | Best early apple in Rhodesia. |
| Cleopatra ... ... ... ... .. ... .. | L | X | X | .. | X | ... | X | ... | X | ... | X | ... | Does well in most areas; subject to water core. |
| Cliff's Seedling ... ... .. .. | L | X | ... | ... | .. | ... | ... | ... | ... | ... | ... | ... | Excellent at Inyanga; untested in other areas. |
| Commerce ... ... ... ... ... ... ... ... | L | ? | ... | ... | ? | .. | ? | ... | ? | ... | ? | ... | Good near Umtali; worth trying elsewhere. |
| Jonathan ... ... ... ... | M | ... | ... | ... | X | ... | X | ... | X | ... | X | ... | Tree poor grower. |
| Lord Wolseley ... ... ... .. ... ... | L | X | X | ... | X | ... | X | .. | X | ... | X | ... | Tree good grower; does well in most areas; subject to mildew and water core. |
| Ohinemuri ... ... ... ... ... ... .. | L | X | X | ... | X | ... | X | ... | X | ... | X | ... | Excellent fruit; must be planted next to White Winter Pearmain for inter-pollination. |

| | Season | Zone 1 | | | Zone 2 | | Zone 3 | | Zone 4 | | Zone 5 | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | A | B | A | B | A | B | A | B | |
| Reinnet du Canada ... ... ... ... | L | X | X | ... | X | ... | X | . | X | ... | X | .. | Good bearer in most areas. |
| Rhode Island Greening .. ... ... | L | X | X | ... | ? | | ? | . . | ? | ... | ? | .. | Best apple at Inyanga; should be tried elsewhere. |
| Rome Beauty ... ... ... .. .. ... | L | X | X | X | X | X | X | X | X | X | X | X | Best apple in Rhodesia; mildew on eastern border. |
| Versfeld's ... ... ... ... ... ... . | L | X | X | X | X | X | X | X | X | X | X | X | Does well in most areas. |
| White Winter Pearmain ... ... .. | L | X | X | . | X | .. | X | | X | ... | X | ... | Excellent in east; necessary to pollinate Ohinemuri. |
| King of Pippins ... ... .. . . . | M | X | X | ... | X | .. | X | ... | X | ... | X | ... | Tree good bearer and grower in most areas. |
| **Pears.** | | | | | | | | | | | | | |
| Bon Chretien (Williams) ... | E | X | X | . | ? | ... | ? | | ? | . . | ? | . . | Best pear; may succeed at high altitudes (inland). |
| Beurre Bosc ... ... ... ... .. | M | X | X | ... | ... | .. | .. | ... | .. | . . | ... | .. | Splits with heavy rain. |
| Beurre Clairgeau ... ... .. . . | M | X | .. | . | . . | ... | ... | .. | .. | ... | . . | . | Good at Inyanga. |
| Beurre Diel ... ... . .. . . | L | X | X | ... | ... | ... | ... | . . | .. | . . | . . | ... | Good at Inyanga. |
| Beurre Hardy ... ... ... ... ... .. | M | X | .. | .. | ... | ... | ... | ... | ... | .. | ... | ... | Worth trying at high altitudes. |
| Clapp's Favourite ... ... ... ... ... | E | X | X | .. | ... | ... | ... | . | . . | .. | ... | .. | Worth trying at high altitudes. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fertility | E | X | X | | X | | X | | X | | X | | May do in most areas |
| Glout Morceau | L | X | X | | | | | | | | | | Excellent on eastern borde |
| Louise Bonne de Jersey | M | X | | | | | | | | | | | Good on eastern border |
| Keiffer Hybrid | L | X | X | X | X | X | X | X | X | X | X | X | Grows everywhere |
| Le Conte | M | X | X | X | X | X | X | X | X | X | X | X | Grows everywhere |
| Smith's Hybrid | M | X | X | X | X | X | X | X | X | X | X | X | Grows everywhere |
| Garber's Hybrid | M | X | X | X | X | X | X | X | X | X | X | X | Untested, should be tried |
| **Quinces.** | | | | | | | | | | | | | |
| All varieties | | X | X | X | X | X | X | X | X | X | X | X | Do best on medium to heav soils |
| **Peaches.** | | | | | | | | | | | | | |
| Alexander Jewel | E | | X | X | X | X | X | X | X | X | X | X | Early, grows in most district |
| Angel | E | | X | X | X | X | X | X | X | X | X | X | Early, grows in most district |
| Florida Crawford | M | X | X | | X | | X | | X | X | X | | Mid season, grows in mo districts |
| Waldo | E | | X | X | X | X | X | X | X | X | X | X | Early grows in most district |
| Killiecrankie | E | | X | X | X | X | X | X | X | X | X | X | Early grows in most district |
| Shackleford | E | | X | X | X | | X | | X | | X | | Early grows in most district |

| | Season | Zone 1 | | | Zone 2 | | Zone 3 | | Zone 4 | | Zone 5 | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | A | B | A | B | A | B | A | B | |
| Bell's November ... ... ... ... ... | E | ... | X | X | X | X | X | X | X | X | X | X | Very early; grows in most districts. |
| Early Alexander ... ... ... ... ... | E | X | ... | ... | ... | . | ... | ... | ... | ... | ... | .. | Early; should do where it is very cold. |
| Le Vainqueur ... ... .. ... ... ... | E | X | ... | . . | ... | .. | ... | ... | ... | ... | ... | ... | Early; should do where it is very cold. |
| Mamie Ross ... ... ... ... ... ... | M | X | ... | ... | ... | .. | ... | ... | ... | ... | ... | ... | Mid-season; should do where it is very cold. |
| Early Crawford ... ... ... ... ... | E | X | X | ... | ... | ... | ... | ... | ... | ... | ... | ... | Mid-season; does well north Rusape. |
| St. Helena ... ... ... ... ... ... ... | L | X | X | X | X | X | X | X | X | X | X | X | Late; seems to grow anywhere. |
| Armitage ... ... ... ... ... ... ... | E | ... | X | X | X | X | X | X | X | X | X | X | Very early; grows in most districts. |
| Florida Gem ... ... ... . . . . ... | E | X | X | X | X | ... | X | ... | X | ... | X | ... | Early; grows in most districts. |
| **Nectarine.** | | | | | | | | | | | | | |
| Goldmine ... ... ... ... ... ... ... | M | X | ? | ... | ... | ... | .. | ... | ... | ... | .. | ... | May do if area is cold in winter. |
| **Apricots.** | | | | | | | | | | | | | |
| Alpha ... ... ... ... ... ... ... ... | E | X | X | ... | X | ... | X | ... | X | ... | X | X | Good, as it is early. |
| Early Cape ... ... ... ... .. ... .. | E | X | X | X | X | X | X | X | X | X | X | X | Best for most districts. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Early Newcastle ... ... ... ... ... ... | E | X | X | ... | X | ... | X | ... | X | ... | X | X | Worth planting in cool areas. |
| Old Cape ... ... ... ... ... ... ... .. | M | ... | ... | ... | ... | ... | ? | .. | ? | ... | X | ? | Won't stand too much early rain. |
| Royal ... ... ... ... ... ... ... ... .. | M | ... | .. | ... | ... | ... | ? | ... | ? | ... | X | X | Won't stand too much early rain. |
| **Plums.** | | | | | | | | | | | | | |
| Methley ... ... ... ... ... ... ... ... ... | E | X | X | X | X | X | X | X | X | X | X | X | Blood plum; good; must not be pruned heavily. |
| Santa Rosa ... ... ... ... ... ... ... ... | E | X | X | X | X | X | X | X | X | ... | X | X | Blood plum; good. |
| Beauty ... ... ... ... ... ... ... ... ... | E | X | X | ... | X | X | ... | .. | X | ... | X | ... | Blood plum; should receive more attention. |
| Francis ... ... ... ... ... ... ... ... ... | E | X | X | X | X | X | X | ... | X | ... | X | ... | Strong grower; good bearer. |
| Burbank ... ... ... ... ... ... ... ... .. | M | X | X | ... | X | ... | ... | ... | ... | ... | X | X | Spreading growth; good on plum root. |
| Gaviota ... ... ... ... ... ... ... ... .. | M | X | X | X | X | X | X | X | ... | ... | X | ... | Good where planted. |
| Wickson ... ... ... ... ... ... .. ... ... | M | X | X | X | X | X | X | X | X | X | X | X | Best eating; large; plant with Kelsey. |
| Satsuma ... .. ... ... ... ... ... ... .. | L | X | X | X | X | X | X | X | X | X | X | X | Blood plum. |
| October Purple ... ... ... ... . . . .. | L | X | X | .. | X | ... | ... | ... | .. | ... | X | ... | Watery; heavy bearer. |
| Kelsey ... ... ... . . ... ... ... .. | L | X | X | X | X | X | X | X | X | X | X | X | Sunburns; pollinates Wickson. |
| **Cherries.** | | | | | | | | | | | | | |
| Most varieties ... ... ... ... ... ... | E | X | ... | ... | ... | ... | ... | ... | ... | .. | ... | ... | Do well at Inyanga. |

| | Season | Zone 1 | | | Zone 2 | | Zone 3 | | Zone 4 | | Zone 5 | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | A | B | A | B | A | B | A | B | |
| **Figs.** | | | | | | | | | | | | | |
| Adam ... ... ... ... .. ... ... ... | L | X | X | X | X | X | X | X | X | X | X | X | Do well where fig weevil is absent. |
| White Genoa ... ... ... ... ... ... | M | X | X | X | X | X | X | X | X | X | X | X | Do well where fig weevil is absent. |
| Other varieties ... ... ... ... ... | .. | X | X | ... | X | ... | X | X | X | X | X | X | Do well where fig weevil is absent. |
| **Almonds.** | | | | | | | | | | | | | |
| All varieties ... ... ... ... ... ... | .. | ? | ... | .. | ... | ... | ... | ... | ? | ... | ... | | Failure up to the present. |
| **Walnuts.** | | | | | | | | | | | | | |
| All varieties ... ... ... ... ... ... | . | X | ? | ? | ... | ... | ... | ... | ... | ... | ... | | Not satisfactory in most areas. |
| **Pecan Nuts.** | | | | | | | | | | | | | |
| All varieties ... ... .. .. ... ... | .. | X | X | X | X | X | X | X | X | X | X | X | Excellent prospects on deep soils. |
| **Citrus.** | | | | | | | | | | | | | |
| Orange— Washington Navel ... .. ... | E | .. | X | X | X | X | X | X | X | X | X | X | Will not stand excessive frost. |
| Valencia Late ... .. ... ... ... | L | ... | X | X | X | X | X | X | X | X | X | X | Will not stand excessive frost. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lemon—** | | | | | | | | | | | | | |
| Eureka ... ... ... ... ... ... ... | ... | ... | X | X | X | X | X | X | X | X | X | X | Will not stand excessive frost. |
| Genoa ... ... ... ... ... ... ... | ... | ... | X | X | X | X | X | X | X | X | X | X | Will not stand excessive frost. |
| Villa Franca ... ... ... ... ... | ... | ... | X | X | X | X | X | X | X | X | X | X | Will not stand excessive frost. |
| **Naartje—** | | | | | | | | | | | | | |
| Old Cape ... ... ... ... ... ... | ... | ... | X | X | X | X | X | X | X | X | X | X | Will not stand excessive frost. |
| Emperor ... ... ... ... ... ... | ... | ... | X | X | X | X | X | X | X | X | X | X | Will not stand excessive frost. |
| Others ... ... ... ... ... ... ... | ... | ... | X | X | X | X | X | X | X | X | X | X | Will not stand excessive frost. |
| **Grape Fruit—** | | | | | | | | | | | | | |
| Triumph ... ... ... ... ... ... ... | ... | ... | X | X | X | X | X | X | X | X | X | X | Best variety in Rhodesia. |
| Marsh's ... ... ... ... ... ... ... | ... | ... | ... | X | ... | X | . | X | .. | X | ... | X | Fails in many areas (coastal variety). |
| **Lime—** | | | | | | | | | | | | | |
| Tahiti ... ... ... ... ... ... ... | ... | ... | X | X | X | X | X | X | X | X | X | X | Does well in most areas; large fruit. |
| West Indian ... ... ... ... ... | ... | ... | X | X | X | X | X | X | X | X | X | X | Hard to propagate; small fruit; excellent. |
| **Mango.** | | | | | | | | | | | | | |
| Most varieties ... ... ... ... ... ... | .. | ... | ... | X | .. | X | ... | X | ... | X | ... | X | Will not stand much cold. |
| **Avocado Pear.** | | | | | | | | | | | | | |
| All types ... ... ... ... ... ... ... | ... | ... | ... | X | X | X | .. | X | . | X | ... | X | Does best on deep. fertile soil; affected by cold. |

| | Season | Zone 1 | | | Zone 2 | | Zone 3 | | Zone 4 | | Zone 5 | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | A | B | A | B | A | B | A | B | |
| Paw-paw ... ... ... ... ... ... ... | ... | ... | ... | X | X | X | X | X | X | X | X | X | Will not stand cold; must be sheltered. |
| Guava ... ... ... ... . .. .. ... ... | ... | .. | X | X | X | X | X | X | X | X | X | X | Severe cold kills trees. |
| Loquat ... ... ... ... ... ... ... ... | ... | ... | X | X | X | X | X | X | X | X | X | X | Large fruited variety best. |
| Tree Tomato ... ... ... ... ... ... ... | ... | ... | X | X | X | X | X | X | X | X | X | X | Does well in most areas. |
| Persimmon ... ... ... ... ... ... ... | ... | ... | .. | ... | ... | ... | ... | ... | ... | ... | ... | .. | Unsatisfactory in most areas. |
| Custard Apple ... ... ... ... ... ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | Unsatisfactory in most areas. |
| Pomegranate ... ... ... .. ... ... | . . | X | X | X | X | X | X | X | X | X | X | X | Grows anywhere. |
| Mulberry ... ... ... ... ... ... ... | ... | X | X | X | X | X | X | X | X | X | X | X | Grows anywhere. |
| Granadilla ... ... ... ... ... ... ... | ... | X | X | X | X | X | X | X | X | X | X | X | A weed in most areas. |
| Litchi ... ... ... ... ... .. .. . . | ... | ... | ... | X | X | X | ... | X | .. | X | ... | X | May do well in most areas. |
| Feijoa ... ... ... ... ... . . ... ... | .. | . . | X | X | X | X | X | X | X | X | X | X | Recent importation is promising. |
| **Banana.** | | | | | | | | | | | | | |
| Ducasse Hybrid ... ... .. ... ... ... | ... | ... | .. | X | X | X | X | X | X | X | X | X | Hardy; severe frost kills plants. |
| Custard ... ... ... ... ... ... ... | ... | ... | .. | X | X | X | ... | X | ... | X | .. | X | Hardy; severe frost kills plants. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lady's Finger | ... | ... | ... | X | X | X | ... | X | ... | X | ... | X | Hardy; severe frost kills plants. |
| Cavendish | ... | ... | ... | X | ... | X | ... | ... | ... | ... | ... | ... | Tender to cold and wind. |
| Plantain | ... | ... | ... | X | X | X | X | X | X | X | X | X | Hardy; will grow in most areas. |
| **Grape Vines.** | | | | | | | | | | | | | |
| Barbarossa | ... | X | X | X | X | X | X | X | X | X | X | X | Does well in Rhodesia. |
| Crystal | ... | X | X | X | X | X | X | X | X | X | X | X | Does well in Rhodesia. |
| White Hanepoot | ... | X | X | X | X | X | X | X | X | X | X | X | Does well in Rhodesia. |
| Red Hanepoot | ... | X | X | ... | X | ... | X | ... | X | ... | X | ... | Shy bearer in certain areas. |
| Catawba | ... | X | X | X | X | X | X | X | X | X | X | X | Grows like a weed. |
| Loganberry | ... | X | X | ... | X | ... | X | ... | X | ... | X | | Promising in most areas. |
| Blackberry | ... | X | X | ... | X | ... | ... | ... | ... | ... | ... | ... | Prefers cold areas. |
| Raspberry | ... | X | X | ... | ... | ... | ... | ... | ... | ... | ... | ... | Prefers cold areas. |
| Pineapple | ... | ... | ... | X | ... | ... | ... | ... | ... | ... | ... | ... | Does not stand frost (coastal). |

**Treatment of Trees on Arrival.**—On arrival of the trees from the nursery they should be placed in a shady spot and kept moist until planted. They should not be left at any length of time in the boxes or sacking in which they were packed, but should be heeled into a trench and kept there until wanted. The heeling-in process consists of digging a trench about 18 ins. in depth, with one side sloping at an angle of about 45°. The trees are laid in not more than two or three deep, the soil being well worked around the roots and the trench then being filled with soil and watered occasionally to keep the trees in good order.

Trees received from a good distance sometimes arrive in a withered condition; these should be completely immersed in fresh water (running water if possible) for at least twelve hours or until the withered stems and branches regain turgidity. The revived trees may then be heeled-in as previously described, or planted if planting preparations have been completed.

**Planting.**—Before planting is commenced it is well to be sure that all the necessary appliances are at hand. These are: Marking board (previously used when double pegging), spade, sacking to protect the tree roots, secateurs (pruning shears) to trim the tree roots and tops, Bordeaux paste and brush to colour-wash the tree stems, and a sufficient supply of water to water the trees when planted.

Everything being in readiness, a few trees are then taken from the heeling-in trench, the roots being wrapped in damp sacking. Proceed to the first filled-in hole and have a small hole dug between the two pegs, then place the marker board end notches against the two pegs. Take a tree from the damp sacking and cut out the broken, twisted, damaged or diseased roots, and shorten back those that are too long. All cuts should be made diagonally on the under side of the roots. Care should be exercised that the roots are not at any time during the planting unduly exposed to sun or wind; cool and overcast days are best for planting, but these favourable conditions are not always to be had.

The stem of the tree is now placed in the central notch of the marker board, with the upper roots almost touching the planting board; the soil is then filled in slowly, the roots

being evenly spread in all directions and well covered. Now remove the marker board and shake the tree slightly with an up and down action; this will assist the finer soil particles to collect round the roots and fill in the air spaces. A slight mound should be made over the roots at the base of the tree, after which the soil should be firmed by tramping it well over the roots and up to the stem. No fruit tree should be planted too deeply; plant no deeper than it stood in the nursery. This depth will be indicated by the nursery mark (junction of the yellow and brown or green bark of the stem near the roots).

It is an advantage to keep the nursery mark 2 ins. to 3 ins. above the normal soil level; the tree will then be well planted, and as the soil subsides the tree will gradually sink to the nursery mark level. If the upper roots of the newly-set tree are very close to the soil surface a small mound of loose soil may be placed over them; this will prevent any over-heating or undue drying of the soil surrounding the shallow roots. The mound will gradually disappear with cultivation, but not before the tree is well rooted and no longer requires this additional protection. After planting, cut the tree back as shown in Fig. 2 (3) for citrus trees, and Fig. 4 for deciduous trees. Single stem trees may be headed back to knee high for deciduous and 30 ins. for citrus trees. Nursery shaped trees should have from three to four main arms retained for most deciduous fruits, with the exception of plum trees, which may have as many as six arms retained. The heading back of the tree will enable the reduced root system (lost when lifting in the nursery) to feed the proportionately reduced top in a normal manner.

Many fruit trees are planted without cutting back the tops; this is wrong, and causes an undue demand on the root system, of which over half was left in the nursery at the time of lifting. The larger the tree, the greater the loss of roots at the time of lifting. To counteract the loss of roots a proportional amount of the top must be cut away at planting. The trees should be watered as they are planted with at least eight gallons of water to each tree, and more if the soil is very dry. The watering will settle the soil and at the same time supply the tree with the necessary moisture with which to revive growth. When the surface of the soil is sufficiently

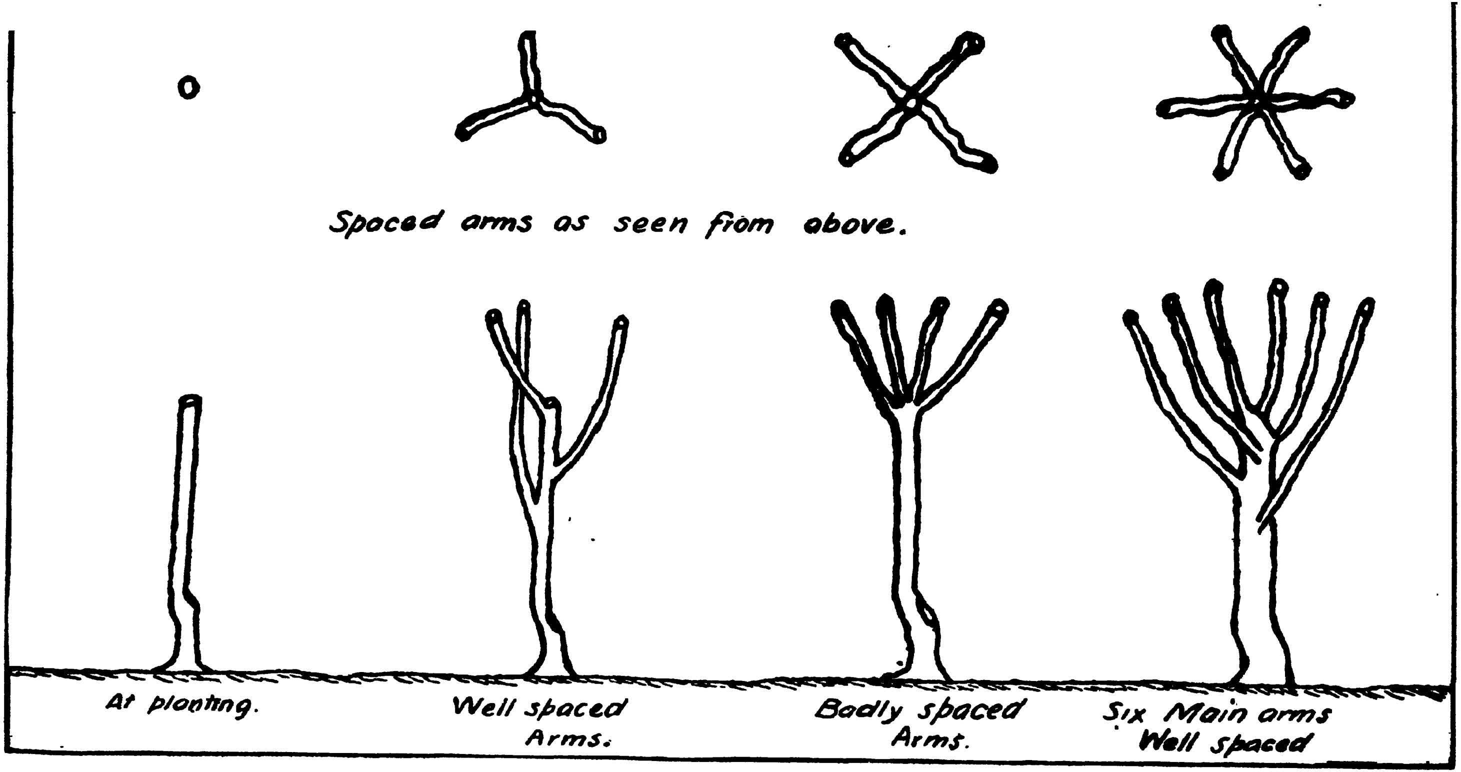

Spaced arms as seen from above.
At planting.
Well spaced Arms.
Badly spaced Arms.
Six Main arms Well spaced

Fig. IV.

dry after watering it may be lightly loosened again to check evaporation.

**Protection from Sun-Scald.**—It is advisable to protect the stems of all newly-planted trees from the hot sun; some growers use grass, but this is dangerous where ants are prevalent. The best temporary method of protection is to colour-wash the stems with Bordeaux paste.

A flat wooden slat of about 3 ins. in width is also useful for this purpose; it should be fixed on the western side of the tree stem. The sun's rays are then unable to shine directly on the tender stem and cause sun-scald. Attach the slat to the tree with string or spiral wire, care being exercised that the binder does not damage the bark of the tree by cutting into it. Trees damaged by sun-scald or those with a tendency to sun-scald should be slit through the bark from the ground level to the top of the main stem, also the main arms—always, however, on the western side; this allows the tree to develop. Naturally, unslit trees are apt to become bark-bound, which dwarfs the trees and affects their productiveness. They are also more susceptible to disease attack.

### Where Fruit is Produced on Different Varieties.

Apple and Pear.—On spurs chiefly, also from terminal and lateral buds. Always on wood of the previous season's growth.

Quince.—From co-terminal buds on wood of the current season's growth.

Peach, Nectarine and Almond.—On wood of the previous season's growth.

Apricots and Plums.—Generally on fruit twigs and shoots produced during the previous season's growth.

Figs.—First crop, previous season's wood; second crop, on current season's wood.

Citrus.—On current season's growth; main crop of fruit on spring growth.

Walnut and Pecan Nut.—On current season's growth.

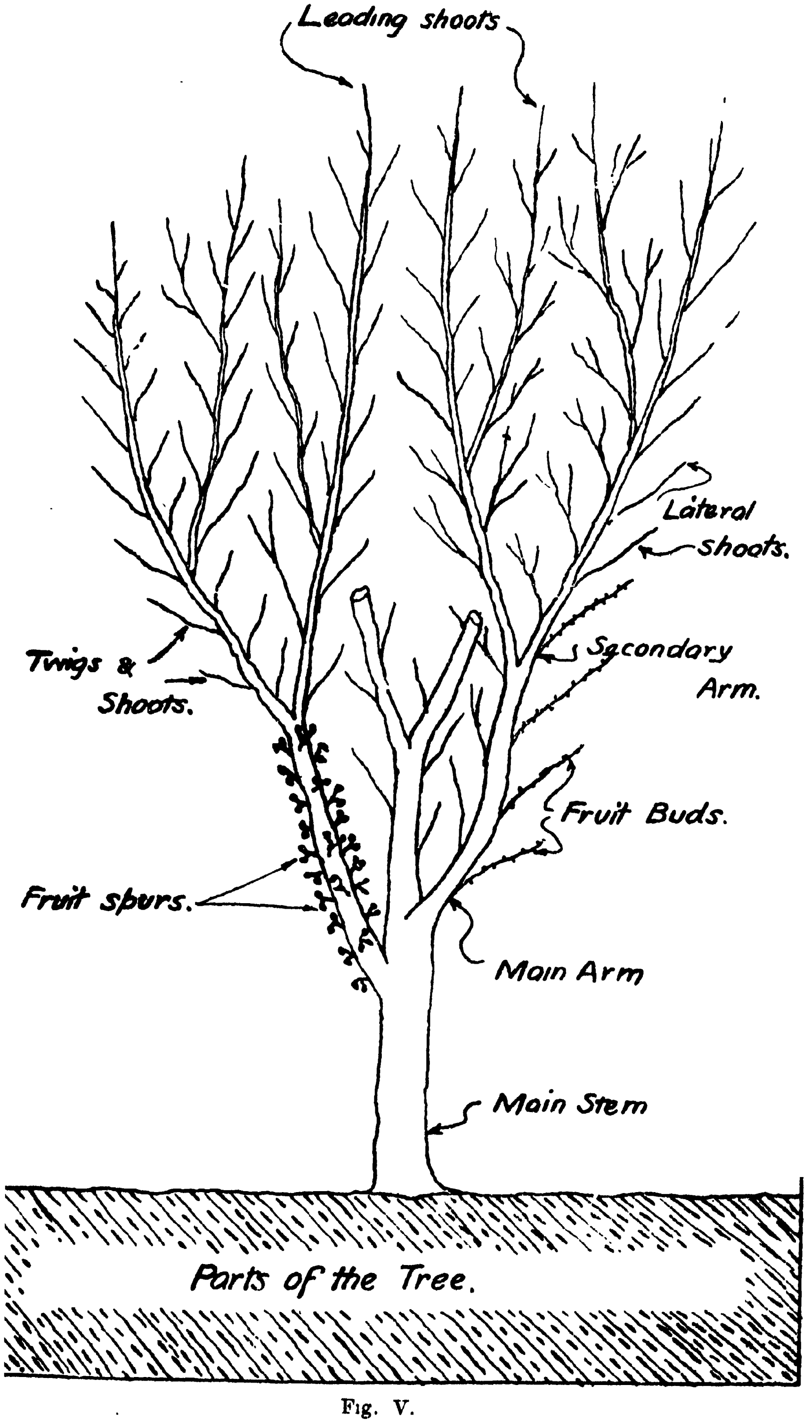

Leading shoots
Lateral shoots.
Twigs & Shoots.
Secondary Arm.
Fruit Buds.
Fruit spurs.
Main Arm
Main Stem
Parts of the Tree.

Fig. V.

Mango and Loquat.—From terminal buds of previous season's growth.

Most other Tropical and Sub-tropical Fruits.—On wood of the current season's growth.

Grape Vines.—On new season's growth.

Fruit buds are easily distinguished from leaf or shoot buds by their plumper appearance. With a moderate amount of experience it is possible to forecast the next fruit crop from the current season's fruit—bud formation.

When the bearing habits of the different kinds of fruit trees are understood it is possible for the fruit grower to regulate by pruning the bearing of each individual tree, and thereby overcome to a great extent the necessity for fruit-thinning after the crop has set.

(*To be concluded.*)

## Dates of Agricultural Shows, 1929.

Umtali.—28th and 29th June.

Rusape.—8th and 9th July.

Gatooma.—2nd and 3rd August.

Bulawayo.—6th, 7th and 8th August.

Gwelo.—15th and 16th August.

Bindura.—15th August.

Salisbury.—21st and 22nd August.

Fort Victoria.—4th and 5th September.

# Salisbury Agricultural Experiment Station.

ANNUAL REPORT, 1927-28.

*(Continued.)*

By H. C. ARNOLD, Station Manager.

## EXPERIMENTS WITH SILAGE CROPS.

**Maize—Distance Planting Trials for Silage.**—These trials are now in their seventh year, and during that period they have shown that when the maize is planted as closely as six inches apart in the row reduced returns are obtained and the quality of the fodder is inferior. On the other hand, when the maize is planted too far apart lower yields are obtained, and both the stalks and ears are so coarse that the operation of chaffing them in preparation for feed is attended by considerable difficulty and sometimes damage to the machinery used. Further, the silage made from coarse stalks is less palatable apparently because of the higher fibre content in the lower and thicker parts of the stems. For these reasons spacings at 6 inches and 24 inches apart in the row have been excluded from these trials during recent years.

*Yields of Green Fodder in Tons per Acre.*

| Distance of planting. | Average of duplicate plots. 1927-28. | 1926-27. | Average 1921-26. | Average over 7 years. |
|---|---|---|---|---|
| 40 in. x 9 in. ... ... | 12.4 | 9.6 | 8.7 | 9.40 |
| 40 in. x 12 in. ... ... | 12.5 | 8.8 | 9.3 | 9.70 |
| 40 in. x 15 in. ... ... | 14.9 | 8.9 | 9.2 | 9.90 |
| 40 in. x 18 in. ... ... | 14.5 | 9.9 | 8.8 | 9.70 |

The tonnage of green fodder likely to be obtained is shown by these experiments to be unaffected by the distance apart in the rows when the spacing varies between 9 inches and 18 inches, but in order that the best quality of silage may be obtained the farmer should consider the fertility of his soil. It is thought that on soil of medium fertility a distance of 9 inches to 12 inches between the plants should be aimed at, but on less fertile soils silage of better quality will result when the plants are spaced from 12 inches to 15 inches in the rows.

Experiments with Niger oil seed (*Guizotia oleifera*) have been continued and have again shown how suitable this crop is for silage, particularly for farmers whose main crop is maize, and for that reason require another kind of crop to use in the rotation. This plant gives very heavy yields of green fodder which, when converted into silage, is greatly relished by cattle. The seed contains a high proportion of oil, which increases the crop's value for silage. The stems are much branched and are thinner than those of the sunflower crop; because of this, it lends itself to packing in the silo without previous chaffing, and in this respect it is found to be a more convenient crop to handle than those having coarse stems. The trials conducted include Niger seed grown as a pure stand and sown between the rows of velvet beans and dolichos beans. Soya and Sudan grass were also included in this series, but the Sudan was destroyed by insect pests, and the return given under this heading this season is really for Soya bean alone.

*Yields of Green Fodder in Tons per Acre.*

| Kind of crop. | 1927-28. | 1926-27. | 1925-26. | Average over 3 years. 1923-26. |
|---|---|---|---|---|
| Niger seed alone ... ... | 14.69 | 6.1 | 12.0 | 13.6 |
| Niger seed and velvet beans ... ... ... ... | 11.70 | 7.0 | 12.5 | 12.4 |
| Niger seed and dolichos beans ... ... ... ... | 13.43 | 5.4 | ... | ... |
| Soya bean and Sudan grass ... ... ... ... | 6.6 | 4.0 | ... | .. |

The high yields recorded this season are probably due to the dressing of eight tons of farm manure which the land received. Niger seed, however, responds to good treatment, and on poor soil the returns are often low, particularly when the rainfall also is below normal.

**Kokoma or Guinea Fowl Grass** (*Rottbœlia exaltata*).—The trials conducted with this grass corroborate those of previous years. Its chief value lies in its ability to produce heavy crops of fodder which can easily be converted into silage of excellent quality at a minimum of trouble and expense. It is an indigenous annual grass, found usually in its natural habitats on rich soils on low-lying situations. In districts in which it grows in the wild it often occurs as a troublesome weed in cultivated land, and up to the present time it is probably better known by reason of its vices than its virtues. When available, however, it may be regarded as a valuable fodder for conversion into silage. Kokoma grass is extremely hardy and produces heavy crops, whether the season is "wet" or "dry." It has not suffered serious injury from either insect or fungoid diseases during the time it has been cultivated here, and its dense growth often reaches a height of eight feet or more. When converted into silage it provides an excellent feed for live stock which is as palatable as Sudan grass or kaffir corn silage and superior to that obtained from Napier (elephant) grass. In order that the crop may re-sow itself each year it should be cut for silage not later than March, and the second growth should be allowed to mature sufficient seed for the next crop. When the seed has ripened and fallen, the land may be disc harrowed or lightly ploughed, after which no further attention need be given the crop until it is ready to cut again in the following season. In order that its crop-producing ability might be compared with that of Sudan grass, adjacent plots have been sown to each kind of grass for the past three seasons. During that time the land on which they have been grown has not been fertilised or manured, and the Kokoma grass has re-seeded the plot each year after the manner described above. The Sudan grass has had to be re-sown each year, thus adding somewhat to the cost of its cultivation. The results of these trials are as follows:—

*Yields of Green Fodder in Tons per Acre.*

| Variety of grass | 1925-26. | 1926-27. | 1927-28. | Average over 3 years. |
|---|---|---|---|---|
| Kokoma grass ... ... | 9.77 | 10.15 | 10.31 | 10.07 |
| Sudan grass ... ... ... | 4.27 | 3.29 | 2.35 | 3.30 |

These results show that the yield of Kokoma grass has been three times as much as that of Sudan, and that although the yield of Sudan has decreased each year since the trials commenced, that of Kokoma grass has been satisfactorily maintained. Samples taken from each plot were analysed, with the following results, which imply that the two grasses are of equal value for stock feed:—

| | Moisture. | Fat. | Crude protein. N x 6.25. | Carbo-hydrates. | Ash. | Fibre. |
|---|---|---|---|---|---|---|
| Kokoma grass ... ... | 9.68 | 1.49 | 8.31 | 40.05 | 9.88 | 30.59 |
| Sudan grass ... ... | 10.07 | 1.27 | 8.88 | 42.20 | 6.72 | 30.86 |

## LIMING TRIALS.

These trials are now in their third year, and during the season under review the results have confirmed previous trials. The first applications of lime were made in 1925, but as lime is a slow acting agent it was not expected that its effect would become apparent until after the first season, and the returns that year showed that the yield on the plots which received no lime was equal to that of the plots which were dressed at the rate of one ton of lime per acre. Last year's returns indicated that the limed plots were less affected by the unfavourable climatic conditions than the plots which were not limed, and the returns this season support those results. The whole of these plots received eight tons of farm manure per acre in 1927-28.

*Maize Yields in Bags per Acre.*

| | Series No. 1. | | | Series No. 2. | | | Average for 2 series over |
|---|---|---|---|---|---|---|---|
| Treatment. | 1925-26. | 1926-27. | 1927-28. | 1925-26. | 1926-27. | 1927-28. | 3 years. |
| One ton of lime per acre ... | 21.0 | 17.4 | 18.0 | 21.6 | 19.2 | 16.0 | 18.9 |
| Half ton of lime per acre ... | 26.7 | 20.0 | 20.0 | 22.7 | 18.8 | 15.3 | 20.6 |
| No lime ... | 22.0 | 14.4 | 16.2 | 19.2 | 11.8 | 9.0 | 15.4 |

Assuming that the yields for season 1925-26 are indicative of the inherent fertility of the various plots before treatment with lime, the effect of the liming may be more accurately gauged from the difference between the total yields for the past two seasons and the yields in 1925-26, as shown in the following table:—

| Treatment. | Average yield of 2 series, 1925-26. Bags per acre. | Total yield, 1926-28. Average of 2 series. Bags per acre. | Increase over yield of season 1925-26. |
|---|---|---|---|
| One ton of lime per acre | 21.3 | 35.3 | 14.0 |
| Half ton of lime per acre | 24.7 | 37.1 | 12.4 |
| No lime ... ... ... ... ... | 20.6 | 25.7 | 5.1 |

This tabulation shows that although the yields for the past two seasons have been lower than those of 1925-26, the decline has not been nearly as great on the limed plots as it has on the plots which have had no treatment. Other experiments have shown that the yields of soils of low fertility decline more rapidly in unfavourable seasons than those of more fertile soils. It is thought, therefore, that the beneficial effects of the lime are probably more accurately reflected by the yields of the plots which received one ton of lime than by those which received a half ton, because the latter were in a higher state of fertility than the others at the commencement of the experiment. These trials imply that the application of one ton of lime per acre was responsible for an increased yield of nearly nine bags of maize. The results of these experiments must, however, be regarded with considerable reservation; many previous liming trials in Rhodesia have failed to show beneficial effects. The investigations are being extended, and, until more conclusive information is available, *farmers are advised to experiment with the use of lime only on a small scale.*

## GROUND NUTS.

The potentialities of this crop are becoming well recognised, and increasingly large acreages are being devoted to its cultivation each year. Beside the yield of nuts for which it is primarily grown, the tops provide a valuable hay which is relished by all live stock. Farmers who collect the top growth of their ground nut crop are well repaid for their

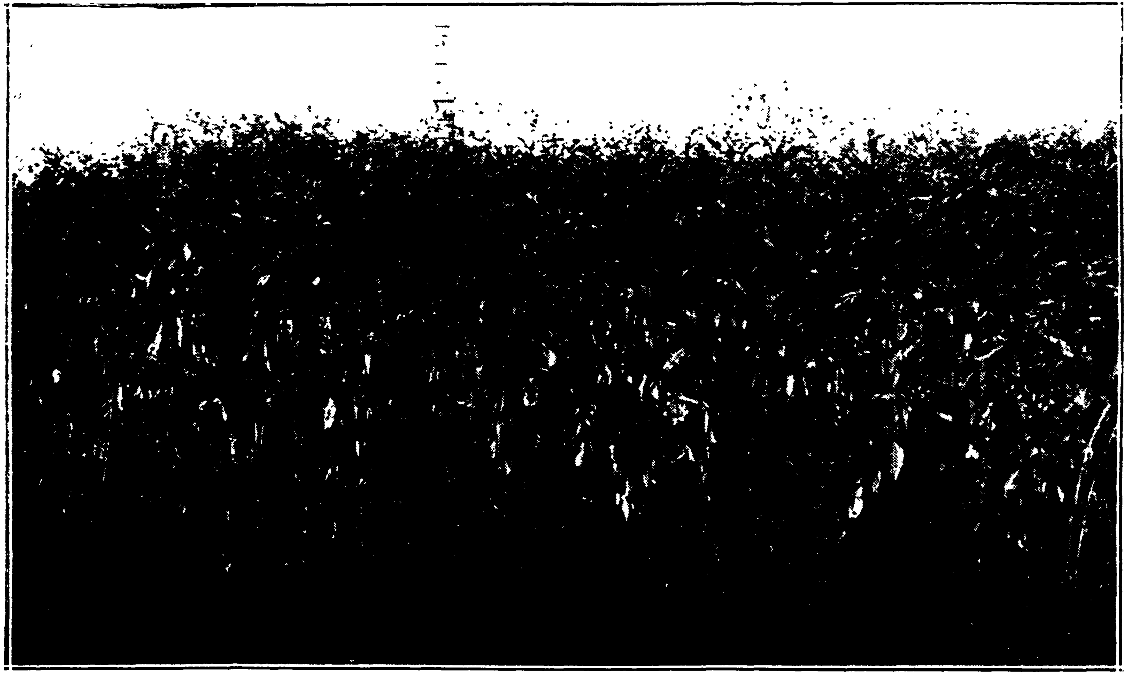


Plate No. 5

Niger-oil seed (*Guizotia oleifera*). The heavy yields of this crop make it specially suitable for green manure and silage.

Sunflowers for green manure. Agricultural Experiment Station, Salisbury.

trouble. During the season under review the yields of ground nuts recorded at this station were equal to those of previous years, indicating that development was not seriously curtailed by the droughty conditions which prevailed during the latter half of the season. The crop possesses greater powers of resisting drought than many others.

**Variety Trials.**—These have extended over a period of five years, during which time several new kinds have been tested against other varieties which are more commonly grown in the Colony. About twenty different strains have been included in these trials, most of which have been received through the courtesy of the Department of Agriculture of the Union of South Africa and of the United States of America. They include six kinds with prostrate stems and fourteen with upright stems. Owing to their spreading habit, those with prostrate stems or "runners" produce their nuts over a comparatively large area, and for this reason all operations connected with the harvesting of the nuts are rendered more laborious than they are with the "bunch" varieties, the nuts of which are clustered near the base of the stem. The returns show that the yields of the "runner" varieties are usually heavier than those of the "bunched" type, but because they produce a larger percentage of immature nuts and are more expensive to reap, the "bunch" varieties are believed to be more profitable for cultivation on a commercial scale.

*Yields in lbs. of Unshelled Nuts per Acre.*

| Name of variety. | Average yield over 3 seasons. 1923-26. | Yield, 1926-27. | Yield, 1927-28. | Average yield over 5 seasons. | Percentage of nuts (kernels) to unshelled nuts (pods) |
|---|---|---|---|---|---|
| *Runner varieties—* | | | | | |
| Jumbo ... ... | 2,123 | 2,930 | 2,900 | 2,440 | 62 |
| Virginia runner ... | 1,920 | 2,710 | 2,840 | 2,262 | 70 |
| Gambia ... ... | 1,767 | 2,400 | 2,450 | 2,048 | 61 |
| Large Japanese ... | 1,630 (1 season) | 2,500 | 2,410 | 1,960 (3 seasons) | 62 |
| Mammoth ... | 2,570 | 2,850 | 3,240 | 2,887 | 62 |
| Chinese ... ... | 2,250 | 2,680 | 2,810 | 2,580 | 68 |
| *Bunch varieties—* | | | | | |
| | (3 seasons) | | | (5 seasons) | |
| Virginia (Victoria, S.R.) ... ... | 1,560 | 2,780 | 3,020 | 2,096 | 69 |
| Virginia (U.S.A.) | 1,717 | 2,450 | 2,540 | 2,028 | 70 |
| African (Union) ... | 1,703 | 1,860 | 2,140 | 1,822 | 75 |
| Natal (Union) ... | 1,540 | 2,320 | 2,120 | 1,812 | 75 |
| Tennessee Red (Union) ... | 1,450 | 2,050 | 2,480 | 1,776 | 75 |
| Spanish (Rhodesia) | 1,467 | 1,780 | 2,390 | 1,714 | 75 |
| Tennessee Red (Agr. Epr. Stn.) | 1,333 | 2,070 | 2,410 | 1,696 | 75 |
| Virginia (Union) | 1,430 | 1,650 | 2,490 | 1,686 | 75 |
| Valencia (U.S.A.) | 1,410 | 1,820 | 2,210 | 1,652 | 75 |
| Spanish (Union) | 1,333 | 1,980 | 2,270 | 1,650 | 74 |
| Improved Spanish (U.S.A.) ... | 1,327 | 2,200 | 1,870 | 1,610 | 75 |
| Java White ... | 1,417 | 1,780 | 1,930 | 1,592 | 76 |
| Spanish 11-25B (U.S.A.) ... | 1,250 | 2,130 | 2,030 | 1,582 | 75 |
| Spanish (Que Que) | ... | 1,890 | 2,360 | ... | 75 |

For the purposes of comparison the majority of the "bunch" varieties may be divided into three groups, and the six "runner" varieties may also be similarly classified. The members of each group are similar in habit of growth, shape of pods, number of kernels in the pods and colour of skin of kernels, etc., so that for practical purposes the members

of each group may be considered to be identical with one another. Thus, "Chinese" is the same as "Virginia Runner," "Gambia" the same as "Large Japanese" and "Mammoth" the same as "Jumbo."

*Ground Nut Varieties Classified and Described.*

| Group I. | Group II. | Group III. | Group IV. |
|---|---|---|---|
| Spanish (Rhodesia) | Virginia Bunch (U.S.A ) | Natal | Mammoth |
| Virginia (Union) | | Improved Spanish | Jumbo |
| Valencia | Virginia Bunch (Victoria, Rhodesia) | Java White | |
| Tennessee Red (Agr. Epr. Stn.) | | Spanish 11-25B. | |
| Tennessee Red (Union) | | | |
| African | | | |

| | Group I. | Group II. | Group III. | Group IV. |
|---|---|---|---|---|
| Type of growth ... | Bunch | Bunch | Bunch | Runner |
| Period of growth ... | 130 days | 145 days | 130 days | 135 days |
| Average acre yield .. | 1,690 lbs. | 2,060 lbs. | 1,650 lbs. | 2,440 lbs. |
| Number of nuts in pods | 2 to 4 | 2 | 2 | 2 |
| Percentage of nuts to pods ... ... | 75 | 69 | 75 | 63 |
| Approximate length of nuts ... ... | 9/16 in. | 13/16 in. | 8/16 in. | 14/16 in |
| Approximate diameter of nuts ... ... | 5/16 in. | 6/16 in. | 11/32 in. | 6/16 |
| Colour of skin of nut | deep red | light red | pale pink | light red |
| Weight of nuts per 1,000 ... ... | 18 ozs. | 32 ozs. | 19 ozs. | 34 ozs. |
| Percentage of oil in nuts ... ... | 49.43 | 43.26 | 49.18 | 43.67 |
| Percentage of protein in nuts ... ... | 27.56 | 28.75 | 28.12 | 27.43 |

Best quality ground nuts are used by the confectionery trades, and these have a very considerably higher market value than nuts of lower quality whose chief value is in the oil which they contain. The residue of the nuts which remains after the oil has been extracted provides a concen-

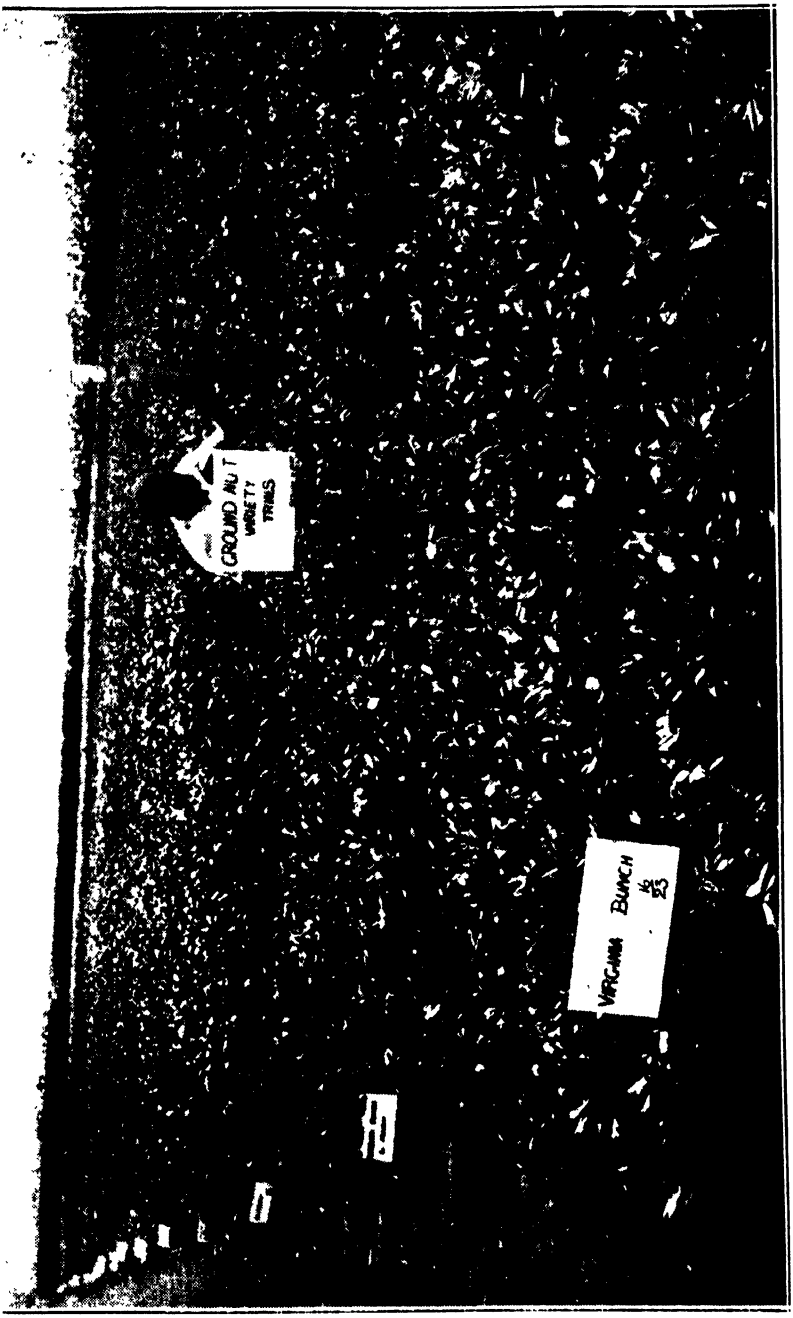
trated stock feed rich in protein, and invariably commands a high price. The crop may also be grown for stock feed. The merits of the various groups for these purposes may now be considered. The following tabulation illustrates the comparative merits of Groups I., II. and IV. as oil and protein producers:—

| | Average yield per acre of unshelled nuts. | Per-centage of nuts to pods. | Yield, nuts per acre. | Nuts contain: Oil. | Protein. | Yield per acre, oil. | Yield per acre, protein. |
|---|---|---|---|---|---|---|---|
| | Lbs. | Per cent. | Lbs. | Per cent. | Per cent. | Lbs. | Lbs. |
| Group I.—Type, Spanish bunch | 1,690 | 75 | 1,265 | 49.43 | 27.56 | 625 | 349 |
| Group II.—Type, Virginia bunch | 2,060 | 69 | 1,420 | 43.26 | 28.75 | 614 | 408 |
| Group IV.—Type, Jumbo ... | 2,440 | 62 | 1,510 | 43.67 | 27.43 | 659 | 414 |

This table shows that, although the Spanish bunch variety yields a few hundred pounds less of unshelled nuts per acre than the other kinds, owing to the low proportion of husks and the high percentage of oil in the nuts, its acre-yield of oil is about the same as that of the others. Farmers who wish to utilise the whole of their crop for stock feed may find the Virginia bunch the more suitable kind, because it produces a larger quantity of top growth, and its nuts contain a slightly higher percentage of protein. From observations made here the Virginia bunch appears to be more drought and disease resistant than the other kinds, so that in areas of lower rainfall it might prove to be the more profitable one to grow for nuts which are destined for the oil factory. The heaviest yields are obtained from the varieties in Group IV., but because of their prostrate habit of growth, their slightly higher yields would be off-set by the extra expense involved in lifting and gathering the nuts. Only in exceptional cases would this kind be the most profitable one to grow, for example, (a) when the crop is to be "harvested" by pigs; (b) when, owing to the very loose texture of the soil, the vines with the nuts attached could be harvested without previously breaking up the land. The varieties enumerated in Group III. cannot be recommended, because their yields are lower than the others and their pods are smaller, making

GROUND NUT VARIETY TRIALS.

The reaped crop. The bags contain the yields of each of the plots, which were 1-45th part of an acre.




GROUND NUT VARIETY TRIALS.

The growing crop in duplicate plots. Twenty varieties have been included in these trials, which have extended over a period of five years.

the work of separating them from the vines more tedious; thus, although their quality is high, they would be less profitable to grow. It should be noted that the variety known as "Spanish bunch" in this Colony is identical with that which appears to be called "Virginia bunch" in the Union of South Africa, but is quite distinct from the "Virginia bunch" mentioned in this report.

## POTATO VARIETY TRIALS.

During the season under review, these trials were rendered useless by attacks of insect pests and virus diseases. Only the trials in which the respective merits of large, medium and small tubers for seed purposes were investigated yielded reliable results. These confirmed the previous experiments which were reported on in detail last year. The plots on which small tubers were used as seed yielded potatoes of inferior size and less than half the weight of those on which the "seed" tubers were of large size. These results suggest the necessity for systematic selection of tubers which are to be used for seed to ensure that only desirable strains shall be propagated.

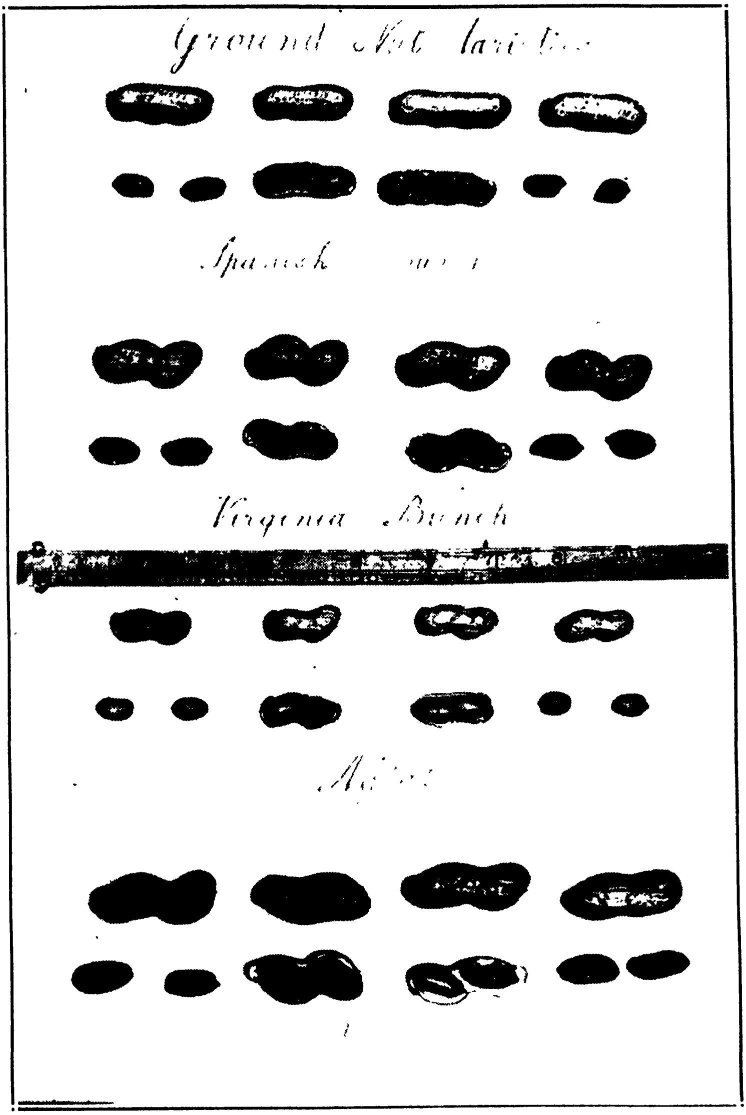
It is well known that when plants of any kind are transferred from one country to another during the process of acclimatisation a proportion of the progeny deteriorate, so that rigid selection becomes necessary to maintain the original high level of productivity. In his book entitled "Plant Breeding" Bailey says: "A plant which is grown for several years in one set of conditions becomes fitted into them, so to speak, and is in a comparative state of rest. When the plant or its progeny is taken to other conditions, all the adjustments are broken up, and in the refitting to the new circumstances, new or strange characters are apt to appear." Potatoes are cultivated in Rhodesia under climatic conditions vastly different from those of Europe, where our stocks originate, and it is to be expected that in their efforts to accustom themselves to the new conditions a number of strains with different tendencies will develop from the original stock.

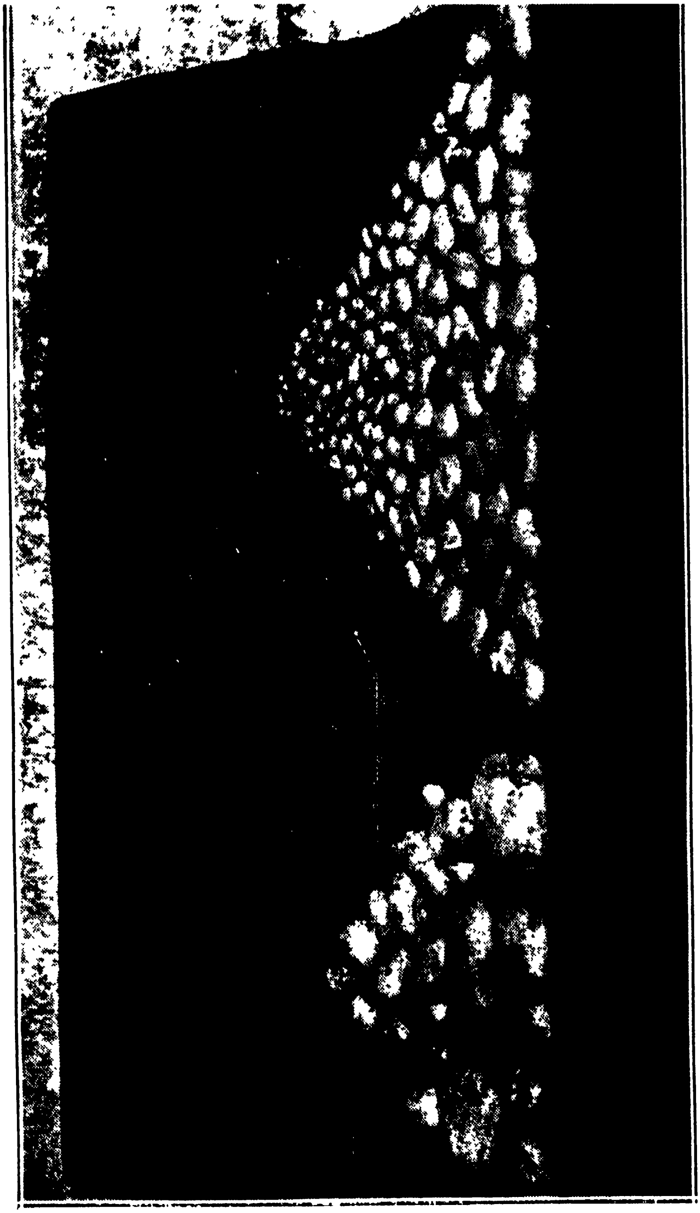
In most farm crops, maize for instance, the desirable strains are those which produce the largest number of seeds; thus, when the crop is bulked, there is a better chance of the

desirable strains being propagated than those which are less useful. With the potato crop the opposite is the case. The desirable strains are those which produce large tubers suitable for culinary purposes and few small ones of the size commonly used for seed, while the undesirable strains are those which produce large numbers of small tubers. The greater the proportion of small tubers produced, the less desirable does the strain become. To investigate this matter further, "seed" from a strain in which large tubers predominated, and other "seed" from a plant whose product consisted chiefly of a large number of small tubers, were planted together on well manured soil. The result is illustrated in the accompanying photograph, in which is portrayed the progeny of two plants which grew next to one another in the row. The triangle on the left of the photograph contains the progeny of a parent tuber of the large-tubered strain, while the triangle to the right is composed of the offspring of a parent tuber of the small-tubered strain. Similar results were obtained from the other plants in this experiment, all of which were of the "Up-to-date" variety. In the progeny of the plants arising from the large-tubered strain, large tubers predominated, while all those plants whose parent tubers were from the small-tubered strain produced a heavy yield, which consisted mainly of small tubers. The potatoes shown in the photograph were divided into three grades. No. 1 grade consisted of tubers which passed over a 1¾ inch riddle and are suitable for culinary purposes. No. 2 grade contained tubers which passed through a 1¾ inch riddle and over a 1¼ inch riddle and which are those commonly used for seed purposes. No. 3 grade consisted of those which passed through a 1¼ inch riddle and are only suitable for stock feed.

*Analysis of Sizes and Weights of Progeny of Large-Tubered and Small-Tubered Strains of Potatoes.*

| | Number of tubers in each grade. | | | Weights in ozs. of tubers in each grade. | | | Totals. | |
|---|---|---|---|---|---|---|---|---|
| | No. 1. | No. 2. | No. 3. | No. 1. | No. 2. | No. 3. | No. of tubers. | Weight of tubers Ozs. |
| Large tubered strain ... | 12 | 2 | 0 | 106 | 4 | 0 | 14 | 110 |
| Small tubered strain ... | 5 | 40 | 102 | 14 | 56 | 22 | 147 | 92 |


Ground Nut Varieties
Spanish
Virginia Bunch



The triangle to the left consists of the progeny of a tuber selected from a large tubered strain. It contains 106 ozs. of potatoes suitable for culinary purposes, but only two tubers of the size commonly employed as seed. The triangle on the right consists of the progeny of a tuber selected from the offspring of a plant in which small tubers predominated. It contains only five tubers, together weighing 14 ozs., of culinary potatoes and forty tubers of seed size.

It is well known that the crop-producing power of potatoes tends to weaken within a few years of the importation of the seed, and often-times rapid degeneration takes place. One of the reasons for this is indicated by the above experiment. It is common practice, when the potatoes are lifted, to collect and heap the whole crop in one place and then to grade as described above. The part of the crop which is too small for culinary purposes is used as seed for the following crop, and in this way the strains in which large tubers predominate are gradually eliminated, while those in which small tubers predominate are propagated, so that after a few years the stock has become so degenerate that it has to be discarded in favour of expensive imported seed. For example, let it be supposed that the newly introduced stock contains 1 per cent. of tubers which produce small tubers and the remaining 99 per cent. produces large tubers in the proportions shown in this experiment. Then in the first crop the tubers in grade No. 2 (of the size commonly used for seed) would be in the proportion of 40 with hereditary characteristics tending to smallness and 198 whose inherent characteristics produce largeness. In the second generation, if all the seed size tubers were planted, the resulting crop would contain 1,600 seed tubers of the small strain and only 396 seed tubers of the large tuber strain. Thus by selecting potato "seed" in the manner described the strains bearing large tubers may become eliminated after a few generations. The examples cited are perhaps extremes, and in a field crop a number of intermediate strains would prevent the productivity of the crop from degenerating quite so rapidly as this theoretical calculation indicates, but the necessity for the careful selection of the tubers which are destined to become parents of future crops is plainly apparent.

(*To be continued.*)

# Labour-saving Devices.

## THE SMALL TRACTOR.

By A. W. V. Crawley, Dawn Ranche, Macheke.

Small tractors, generally known as cultivating or garden tractors, have been in use for some years in America and are now coming into general use in England and the Colonies. They were originally produced for the use of market gardeners and small vegetable growers. With improved models their use has gradually spread to farms, small holdings, etc. At present I do not know of any agents in Rhodesia stocking these small machines, but they will probably be available before very long as farmers and others have been making enquiries for them. I have been trying one of these tractors for nearly two years and find it extremely useful for many purposes, particularly for belt work. They would be very useful and labour-saving for small holders and others near towns.

At first sight many people imagine that these diminutive machines are merely toys, as it is difficult to appreciate the amount and quality of the work of these tractors, unless they can be seen under actual working conditions. Most natives could be taught to run these tractors in less than an hour and do very good work with very little risk of damaging the machine or the implements used. Having handles something like those of the ordinary single-row cultivator, the operator simply holds the handles to guide the machine, which runs along anywhere under its own power. One handle has a simple clutch control attachment for starting and stopping; while the other handle has the carburetter control, which can be worked with one finger. There is no gear change on most models; simply opening the throttle gives more speed when cultivating or more power when used for belt work. An

adjustable stop on the control allows the engine to idle and prevents the operator inadvertently stopping the engine when turning or doing light work. It should be noted that most of these small tractors are moved only under their own power; they cannot be pushed or pulled about like a wheelbarrow. This feature enables them to do any belt work without requiring any elaborate setting; simply drive them to the required positions and release the clutch to stop the tractor. Whilst not very necessary, it is advisable to place a stone or piece of wood in front of one wheel. Although usually used as a walking tractor, some of the higher-powered machines can be fitted with a light riding attachment for the operator. With natives using the tractor better results are obtained with the operator walking behind and guiding the tractor by the handles. At first the operator generally lets the machine run too fast and tries to hold it back by hanging on to the handles instead of slightly closing the throttle to regulate the speed to the operator's own walking pace.

There are two types of these small tractors—the two wheel and the single wheel. The single wheel type presents some distinct advantages, and if properly designed is possibly better suited to Rhodesian conditions, especially if it is to be used by natives. Most of these tractors are much alike as to size, but vary greatly in power, which ranges from 1 h.p. to 4 h.p. on the belt, with a drawbar capacity of approximately half the belt power. I am strongly in favour of the tractor for farm use being at least 3 h.p., and my own opinion is that the tractor below 3 h.p. is not suitable for Rhodesian conditions generally. For the farmer the 3½ to 4 h.p. machine will be most suitable. In this connection it should be noted that British-made machines generally have a reserve of power above their actual rating; other makes rarely have. For market gardeners, nurseries, small holdings and experimental plots these small tractors are capable of handling most of the work. With a seeding attachment, seeding can be done in rows or in groups at any required distances apart, doing two or three rows at a time. Cultivating between rows from twelve inches to five feet can be done as fast as a man can walk, with the cultivating implements under perfect control at all times. Two to three acres per day can be cultivated, according to soil conditions,

width and depth of cultivation. The petrol consumption is from four to eight hours' work per gallon, according to the conditions. All the usual cultivating tools can be used, such as sweeps (8 to 12 inch), bull tongues, shovels, side hoes, hillers, small harrows and furrowers (10 to 20 inch). Ploughs from 7 inches to 10 inches can be used, doing about an acre per day, ploughing 6 inches deep. Lawn mowers from 18 inches to 30 inches in size are easily handled by the tractor. All the various kinds of small machines can be run by belt, and loads up to 1,500 lbs. weight can be pulled on the level by attaching a light trailer or two-wheel truck. On many farms these small tractors would prove to be labour savers. In my own case I have a chaff cutter in one place, a maize sheller in another and a grinding mill at another place. A small portable engine would do the work, but it would require carrying or hauling to the various positions, whereas the tractor runs there on its own power, with only one man to guide it. The tractor practically provides an engine, giving from ½ to 4 h.p. for any belt work anywhere, and gets to the job as fast as one can walk. Pumping water, running electric light, operating milking machines, separators, churns, sawing wood and running concrete mixers are some of the uses the tractor can be put to. Some farms have a lot of small machinery, such as ensilage cutters, chaff and maize stalk cutters, small mills and small two-hole shellers which are generally worked by natives. Few of these machines could be economically worked by the large farm tractor, but in case of labour shortage the small tractor would do the work at a minimum of expense. Last year I ran an ordinary small two-hole sheller all day at maximum speed, using one gallon of petrol per day. Actually two shellers could have been run by the same tractor, as they only require about 1½ h.p. each. A small grinder run by the tractor grinds a bag of maize to fine meal in one hour at a cost of 9d. It crushes four bags per hour at a cost of 2¼d. per bag. The grinder is not quite a suitable size for the tractor, which makes the cost a little higher than it should be. In case of labour shortage the tractor could be used for farm cultivation. It cultivates maize, a single row 36 or 42 inches wide at a time, doing two to three acres per day, according to depth, using from 1½ to 2 gallons of petrol. The work done is very much better than by ox cultivation. It will

work under conditions that oxen cannot. For example, a patch of maize some 3 feet high became waterlogged, and oxen could not work in the wet ground; the small tractor, with a furrower attached, successfully drained the ground. For the cultivation of tobacco these machines are excellent. Being so easily handled, no damage is done to the plants, and the work can be done quickly and much better than with oxen.

For Rhodesian conditions it is important to have all working parts of the small tractor enclosed and protected from dust and dirt, and an efficient dust-proof air filter must be fitted. Practically all the American machines are for use with petrol only. One British-made small tractor can use petrol or paraffin.

## Protection of Koorhaan

Government Notice No. 240 of 19th April, 1929, proclaims that koorhaan shall be strictly protected and not hunted or destroyed throughout the Colony of Southern Rhodesia for a period of five years from the date of publication of the Government Notice.

# Poultry Husbandry.

## ARTIFICIAL INCUBATION, BROODING AND REARING OF CHICKENS.

By H. G. WHEELDON, Assistant Poultry Expert.

Anyone who contemplates starting poultry-keeping is confronted with the problem of "breeding." The pivot point on which the success of a poultry man turns is his ability to reproduce stock. The profitable period of a fowl's life is so short in duration that it is necessary to raise stock for the laying pens every year, and the beginner finds this to be the hardest part of the whole business, the success of which is most important. Success is attained only by the intelligent application of correct methods. If the incubation, growth and development of the chicks are not accompanied by such conditions as produce and maintain the good health necessary for building up a vigorous bird with strong constitutional qualities, the mature bird does not have the power to produce or earn more than a nominal profit for its owner. However well it may be housed and cared for, the effect of any adversity during the chick's life does not stop at the profit of the first year. The progeny of such birds are not only weak and unremunerative, but if raised under like conditions will be less valuable than the parents, and such rapid deterioration will render the flock absolutely unprofitable in two or three generations. On the other hand, chicks well hatched from good eggs, if given intelligent care and surrounded with the essentials required for proper growth and robust development, will mature into fowls which are capable of returning to their owner the last farthing in payment for the food and accommodation provided. Good methods, well-grown and matured stock increase the productive efficiency

of succeeding generations, and the road to successful poultry keeping is immediately opened.

The chick hatched for the market must make a very rapid growth; not so much of bone and muscle as of flesh and fat. To do this in the shortest time assures the greatest profit, and the conditions and methods of rearing in many cases must be largely artificial. The chick destined for the laying house, however, must be allowed to grow steadily without a set-back, and natural conditions must be approximated as closely as possible with a view to developing bone and muscle with a vigorous constitution; the young birds will then stand the conditions of heavy egg yielding which are necessary to produce the results that count.

In building up a strain of fowls there is something even more important than breeding for standard points and prolific egg production, and that is breeding for health and constitutional qualities. Those who are successful in the business on a large scale have learned by experience that it pays to breed for vigour and vitality. The natural method of breeding is the "survival of the fittest," and we need to take some of this "back to nature" doctrine into the poultry-yard and to begin now to breed for inside value, not alone in this season's chicks, but season after season for all future generations of chicks. Every breeder knows that inside values count in breeding, and if not inherent they cannot be depended upon to come out in the chick, as inherited faults or weaknesses are often faithfully transmitted to the offspring for several generations, with the tendency to increase rather than to lessen.

**Breeding Stock.**—Select every bird for the breeding pen first for health and vigour, and then for desired qualities in other desired respects. Choose only the best to breed from, even if a few birds only are used, and so mate them that similar physical defects will not be found in both males and females, and thereby try to offset defects in one parent by breeding to it a bird that is strong where the other shows weakness. When the choice is made and the fowls well mated, then house, manage and feed them sensibly, with a view to producing maximum health and vigour. The needs of the fowls are of the simplest: a comfortable shelter when

needed, a fair variety of wholesome food, pure water to drink and an abundance of fresh air to breathe at all times, without draughts, are important essentials. When in doubt study the fowl; often the natural instinct given to it for self-preservation will be a good guide to follow, and to one whose heart is in the work it is as interesting as it is important, and offers opportunity for the full exercise of both the mental and physical powers.

It is not sufficient to exercise reasonable care with the breeding stock alone; the care and the management of the eggs between laying and hatching, during the hatch, and of the chicks to maturity or breeding and laying age are of equal importance. It is upon the common-sense application of these truths that the success of poultry culture in the future depends, as year after year complaints are heard of lowered vitality in the flocks, the greater difficulty in obtaining a good percentage of fertile eggs, of poor hatches, dead in shell, and of chicks that, though a fair percentage hatched, did not thrive. Is it not fair to assume that the lack of power to live and reproduce is due almost wholly to impaired constitution, to breeding, housing, hatching, rearing and feeding, without due consideration to reproducing inside values in health and vigour?

Assuming then that the breeding birds have been well selected and mated, well housed and supplied with their natural requirements, such as grit, lime or oyster shell, animal food, pure water and abundance of green food daily and fed on sound wholesome foods, and provided with ample litter in which to exercise, the next point of importance is the proper care of the eggs for incubation, and this is where many poultry keepers unconsciously go wrong. Careless methods of handling and keeping eggs impair the fertility, and hatching power in many cases may be entirely lost by wrong methods of handling eggs for incubation. Probably more chicks are found dead in the shell or die soon after hatching every year from this cause than from any other.

**Eggs for Hatching.**—Eggs intended for the incubator should be gathered once daily in the cool weather and twice daily during the very hot weather. Renew nesting material often, handle the eggs with clean hands, place them in a clean receptacle and keep them in a rack

with small end downward, or if they are kept on their side care should be taken to turn the eggs regularly each day to establish the air space in the proper place; avoid excessive evaporation of the contents through drafts of air by keeping them in a cool, fresh room where the temperature does not go below 40° or above 60° F. Wherever possible they should be used for incubation before they are ten days old. Prolonged exposure of the eggs to a temperature of 80° or 90° or frequent warming and cooling while keeping for hatching may kill the germ or will surely result in a weak chick. Select only the best and uniform eggs for hatching.

**Artificial Incubation.**—Faulty incubation is accountable for much loss. This may apply both to the natural and artificial systems, although more frequently the latter is at fault. This is because so many things that will injure the chick may happen with good machines in the hands of poor operators or poor machines in the hands of good operators. It should be mentioned, however, in justice to the most modern systems of incubation, that good results are invariably obtained if the machine is properly operated. There are certain types and makes of incubators, such as moisture machines and hot air machines, each of which has different essentials that are important to successful hatching of the eggs, and it is advisable to understand thoroughly and to follow the printed instructions accompanying each machine. In choosing an incubator be sure to get a machine of sufficient capacity to meet your requirements. It is much better to be obliged to set 50 eggs in a 100-egg machine than to have 100 eggs you want to hatch and only a 50-egg machine to put them in.

The most important points to consider in selecting the locality for a machine are freedom from excessive vibration, air free from foul odours and a solid level floor or platform on which to set the machine. It is very important that the incubator be level, otherwise the egg chamber will not heat evenly. Ventilation of the room may be secured and controlled by dropping the windows at the top and raising them at the bottom, and preventing a draught in severe or rough weather by inserting hessian-covered frames in the open spaces. By having these frames in two or three sizes and one or more windows the situation may be thoroughly mastered

After studying the instructions carefully and setting the machine in a well-ventilated place, but not in a draught, run it empty for a few days until you become thoroughly familiar with every detail, and have the regulating device properly adjusted so as to maintain an even temperature of 102½° to 103° in the egg chamber. One should be careful about the thermometer being correct before placing the eggs in the machine. It is necessary to fumigate the egg chamber with formalin before the eggs are placed in the machine and after each hatch. After the operation of the machine is thoroughly understood and the desired temperature maintained in the empty incubator, the eggs may be put in and left for several hours to warm up, being careful that the temperature does not run much above 103°. After 24 hours the eggs should be turned twice and aired once daily. These turnings should be as nearly twelve hours apart as possible. There are no infallible rules for the running of an incubator. The amount of moisture and ventilation required, the manner of turning and cooling the egg and the many details of the operation cannot be indicated in a definite manner for every machine, and are subject to variation according to the make, the system of the machine and the external conditions under which the machine is being worked. The usual way of turning eggs is to remove them from the centre of each row in the tray to the ends of the rows, and with the hand gently roll the balance inwards towards the centre of the tray. This method may be adopted for the morning turning and cooling, and in the evening give each egg a quarter or half a turn, and then close the drawer without cooling the eggs. As to the length of time for cooling the eggs, no hard and fast rule can be given, and this must be left to the discretion of the operator. In very hot weather, however, when the temperature of the incubator and the room runs high, the eggs may be cooled from five to fifteen minutes longer than under ordinary conditions, remembering always that during the last week of incubation the eggs also require more air than they do during the first ten days. Under ordinary conditions the eggs are aired and cooled during the early stages of incubation sufficiently to give best results while they are being turned. A point of great importance is to turn the flame of the lamp very low during the time the eggs are being cooled.

The embryo chicks generate animal heat as soon as they commence to make growth, and the volume of heat increases steadily towards the latter part of the hatch. This is the reason why the temperature in the drawer usually rises during the last week or ten days, and it may be necessary to re-adjust the regulator very carefully during this period. It is inadvisable to tamper with the regulating device during the hatch, but it must be done if the temperature tends to run much above 105° F.

Eggs should be tested twice during the hatch, the first test being made on the seventh day and the second on the fourteenth day. At the first test remove from the drawers or trays all unfertile eggs, broken yolks and dead germs. Mark those which are doubtful, and let them remain in the machine until the second test; if they do not develop before that time they should be removed, as well as all other dead and weak germs and addled eggs. Discontinue turning the eggs on the morning of the twentieth day, or sooner if the chicks begin to break the shell, and push the drawers or trays well back as far as they will go; in some machines a space is provided for the chicks to fall through into the nursery below, which should be opened. Close the machine and leave it alone until the hatch is over or until the morning of the twenty-first day, when the empty shells may gently be removed. If the machine has been properly regulated it is perfectly safe to leave it, and it will do no harm if the temperature runs to 104½° or 105° when the chicks are hatching, but it should not go higher. Allow the chicks to rest in the drying box of the machine for twenty-four to thirty-six hours after hatching, then remove them to the brooder, which should have been previously well cleaned and littered and which should be placed with the chicks in a sheltered sunny locality. Keep them exposed to the sun as much as possible, taking care to provide shade for use when they require it. At this stage and until a few days old the chicks must be carefully attended to, and a point of great importance is not to allow them to become chilled. Be guided by the chirp of the chicks, which tells plainer than words whether they are thrifty or uncomfortable, and should be taken notice of immediately, as the usual requirement is warmth. The successful rearing of chicks depends on three essentials: good chicks

to start with, a good brooder properly handled, and a good ration intelligently fed. These essentials, combined with a liberal amount of common sense, will ensure the growing to marketable size or to maturity a large percentage of the chicks placed in the brooders after hatching. Lack or neglect of any one of these will result in slow, uneven development, heavy losses among the chicks and a lack of health, vigour and productive qualities in the mature stock. Under such conditions the poultry enterprise is more likely to become unprofitable and a disappointment rather than a source of pleasure and profit, which it should be.

**Artificial Brooding.**—Artificial brooding is a comparatively easy matter to follow. When natural brooding is employed, more than half one's anxiety is removed, and when the work is to be conducted on a small scale this method will answer. The principal aim in natural brooding with hens is to provide a dry, clean, well-ventilated coop with slatted front for the hen and her brood, the chicks being allowed to run outside, and to keep hen, chicks and coop free from lice and mites. The natural method of brooding is not economical and a waste of time for both the poultrymen and the broody hens, and is not advisable on the farm where one hundred or more chicks are to be brooded at one time. Where large numbers are to be hatched and grown, any but the artificial system would be too laborious and out of the question. The only change to be considered is artificial brooding, either in the form of fireless brooders or in a heated brooder house. For the poultry keeper who occupies a permanent place and has had ample experience and is financially "easy," it is a simple matter to instal a suitable brooder house with the necessary conveniences. There are a great many types of brooders used—fireless or cold brooders, lamp-heated brooders, hot water pipe and flue systems and coal-burning brooder stoves. Every one of these types is giving satisfactory results under some conditions. In selecting a brooder, consider carefully these essential requirements. A good brooder is portable; it is easily moved from place to place and adaptable for use as may be required; it should be convenient, easily handled, economical and safe. Heated brooders must be easily regulated and must provide a central area of heat where the temperature may be kept warmer than

the chicks require without warming the corners of the brooder house. This condition will provide zones of heat of varying temperatures on the brooder house floor. The chicks should have freedom to choose for themselves the temperature they like and need.

**Fireless Brooders.**—The trouble with most brooding systems is the cost, and poultry keepers who are out to save expense and are running their poultry to make money are always keenly alive to the possibility of saving money and time. The need of finding a cheap and efficient means of mothering the hundreds of chicks to be raised this season has become a matter of great importance; and for the economical brooding of chicks in small lots, therefore, the use of the out-door colony brooders is advocated, since they are easy to make vermin-proof and can be moved about and placed on fresh soil as frequently as may be required. During the off-season they may be used for penning breeding cocks and cockerels. The accompanying diagram (fig. 1) is a design of a suitable out-door colony brooder having a capacity for fifty chicks.

The brooder should be ready, *i.e.*, thoroughly fresh and cleaned, and the floor littered with finely-cut straw or grass. For the first two or three days the chicks should be confined to the hover section, allowing the sun to shine through the wire and glass doors all day; on the third or fourth day they may be given the opportunity of using the exercising apartment of the brooder, and later allowed in the attached wire run. During the first two or three days the hover must be lifted frequently and placed over them again after feeding and before they have an opportunity of becoming chilled. By frequent handling in this manner they will soon learn what is required of them, and may soon be trusted to take care of themselves when in need of warmth. If they show any disposition to crowd or huddle together at any time, drive them under the hover to warm up. After they are a week or ten days old they may be provided with and allowed access to the wire run. A good shelter for shade is a desirable addition to the brooder run. Not more than fifty chicks should be placed in one flock in any brooder, as this is considered the maximum limit of safety. Care must be taken to keep the chicks warm and comfortable at all times, and to

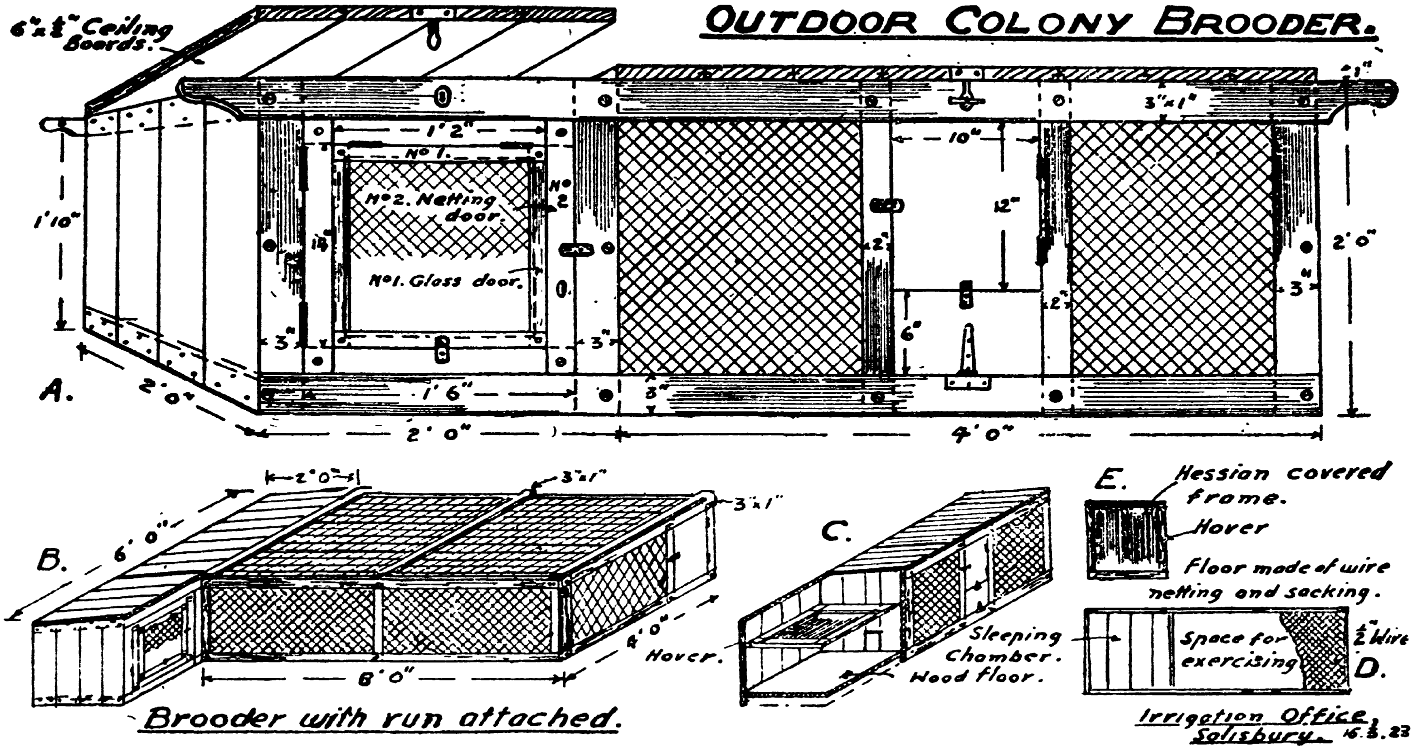



Fig. 1.—A. Brooder, showing lid in two sections. B. Brooder with detachable run attached. C. Brooder with front and side of brooding chamber removed, showing boarded floor, partition and entrance to exercising quarters. D. Indicates floor of exercising quarters, made of hessian and wire netting. E. Hessian covered hover to fit in the brood chamber.

see that they are always supplied with an abundance of pure fresh air. The chicks should be given an opportunity to exercise in quarters that are not too cramped or crowded, remembering always that over-crowding does as much harm as improper feeding, especially if over-crowded under the hovers at night. Sun and air the hovers daily, as well as the litter; the latter should be forked up and cleaned and aired and renewed as often as may be necessary. For poultry keepers who desire to brood smaller lots of chicks—up to 25 in number—a petrol box may be converted into a suitable brooding chamber, with hover and a small run attached.

*(To be concluded.)*

# Wire Worm Remedy.

The Chief Veterinary Surgeon announces that from 1st May the price of wire worm remedy will be 1s. per tin of 100 doses, and the dosing outfit complete 10s. each.

# Wheat.

*(Concluded.)*

## A STUDY OF THE PLANT, ITS SEED, AND AN ACCOUNT OF EXPERIMENTS TO TRY TO PRODUCE A VARIETY SUITABLE FOR SOUTHERN RHODESIA.

By T. K. Sansom, B.Sc. (S.A.),
Southern Rhodesia Government Research Student, Gatooma (January-September, 1926); Plant Breeding Institute, University of Cambridge (October, 1926-October, 1928).

**Rust.**—Up to the present, in this Colony there has been no wheat evolved which possesses the necessary milling qualities and does not take the rust; there are, of course, wheats which are rust-free, but they are lacking in such qualities as baking strength, yield, etc. Consequently, owing to the ravages of rust, the average yield throughout the Colony has been extremely low in the past.

Rust occurs on all the above-ground parts of the plant, but it is most destructive when the stems are attacked. The first signs of infection are pale yellow spots; these later develop into large reddish-orange areas, on which numerous one-celled spores ("Uredospores") are produced. They are very easily distributed by wind, and under favourable conditions new centres of infection are started. In colder climates they are able to continue the life cycle only in the presence of the barberry plant, on which other spores are produced, but in warmer climates, such as the climate of South Africa, the barberry is not indigenous, yet rust in this country is as destructive as in any other part of the world. It is believed, however, that in South Africa the rust is

carried over from year to year by means of the Uredospores, or that wheat can be infected by rust spores from grasses.

The presence of rust in and on the leaves hinders the growth of the plant, lowers the yield and increases the proportion of shrivelled grains. In severe attacks no grain is produced and the leaf and stems are worthless for hay, becoming quite brittle and paper-like. It has been estimated that rust diminishes the world's wheat crop by something like one-third. The grain rusts are the most important of all fungous plant diseases, hence the creation of rust-resistant varieties is a very important problem. In certain parts of Canada and the United States they are considered to be the greatest single hazard in the production of wheat. In New South Wales alone the loss caused by stem rust in wheat in 1916 was estimated to have exceeded £2,000,000.

The same difficulty of wheat suffering from rust was experienced in England, more especially so in the Fen country, but Sir Roland Biffen, Professor of Agricultural Botany, and Professor Engledow, of the Plant Breeding Institute of the University of Cambridge, have produced new varieties of wheat which in rust resistance and baking strength are a very great advance on any other varieties in cultivation in the country. The writer while at Cambridge was able to compare all varieties, and there is no question of the superiority of these new varieties. These new rust-resistant varieties make, on the market, four or five shillings per quarter more than the ordinary English varieties; they also give an average yield of about six bushels per acre more than other varieties.

Breeding for rust resistance is a matter of making crosses between varieties which are rust-free but probably have poor yielding capacity and bad baking strength and between varieties which are good yielders and have good baking strength, but are badly affected with rust. From the progeny of these two varieties it is then necessary to select plants which combine all the good characteristics, *i.e.*, rust resistance, yield, baking strength, etc., etc., of the parents. This work will naturally extend over a few years, but it is hoped that very definite results will be obtained.

**Annual Requirements of the Colony.**—It has been estimated that the annual requirements of Southern Rhodesia

are approximately 70,000 bags, of which roughly only 6,000 are home-grown, the remainder being imported. From the above figures it is very evident that steps should be taken by farmers, as soon as a suitable wheat is produced, to increase this yield. As the population increases so naturally will the annual requirements increase. Countries which formerly were exporting the great bulk of their wheat crop are gradually absorbing more and more for home consumption.

The reasons for the Colony's present low production have been given as follows:—

1. Insufficient proper machinery for sowing, threshing, reaping and cleaning the crop.
2. Difficulty and distance of transporting the grain from many of the possible wheat areas to the mill or railway.
3. Lack of knowledge of methods of culture suited to local conditions.

But should a variety of good quality be produced there seems to be no reason why all these difficulties should not be overcome.

**Preliminary Experiments.**—Preliminary experiments are now being conducted by the writer at the Salisbury Agricultural Experiment Station. All varieties which previously have been grown in this Colony, as well as new varieties from other countries, are being tried out, and it is hoped that within the space of a few years some variety which is definitely superior to any of the existing varieties will be produced.

This season there are forty-five varieties under trial, and thousand corn weights have been made of each variety. The weight of the grains themselves compares very favourably with the weight of grains of wheat of other countries, but low yield and attack by rust and bad quality at present are the limiting factors in the successful cultivation of this cereal.

A brief description of a chess-board trial will serve to illustrate the method by which varieties are tried out against each other.

Let us suppose we are to test four varieties (A, B, C, D) by sowing four plots for each variety in a "chess-board." It is necessary to arrange the sixteen plots so that each row and column of the square contains one of each of the varieties, and yet the arrangement is otherwise to be random; it is necessary that the plots should be so arranged that any differences in soil should be overcome.

Anyone who has made even a superficial study of soils will observe that the soil varies very greatly, even over small areas; consequently, unless these plots are arranged at random over the chess-board, the results will not be significant. Before laying out a chess-board it is necessary at first to draw a diagram with four rows and four columns to represent the sixteen experimental plots.

By suitably allocating four faces of a die we can throw to find out which variety shall occupy the top left-hand corner. Let us suppose B. We then proceed along the top row, throwing a die each time, and get C and A. The fourth must be D. Next the left-hand column is suitably filled by D, C and A.

The intersection of the second row and column can now only be filled by A or B, and a throw of the die makes it A. The intersection of the second row and third column may be B or C, and we find C. The last of the second row is therefore B. By proceeding in a likewise fashion for the remaining two rows the following arrangement of plots is obtained:—

| | | | |
|---|---|---|---|
| B | C | A | D |
| D | A | C | B |
| C | B | D | A |
| A | D | B | C |

An examination of the above diagram will show that each variety is represented in each row and in every position of the row. By laying out the plots in such a manner any difference of soil which may occur in the particular trial will be overcome. The above table is only one of the 288 possible arrangements that can be obtained.

At the Agricultural Experiment Station, Salisbury, five varieties are being tried out against each other per chess-board, making in all 25 beds; this in no wise affects the layout or results of the experiment. As a matter of fact, in

planning agronomic experiments it is far better to use plenty of replications so as to make quite sure that the results are capable of being considered to be a random sample of the population about which one wishes to draw conclusions. In each bed there are eight ranks (rows), with fifty plants in each rank, making 400 plants in all per bed. In small scale yield trials and studies of cereal plant development a spacing of six inches by two inches is very convenient. Sowing is done by means of a "Multiple Dibbler," which consists of a flat sheet of iron, a quarter of an inch in thickness, with holes drilled at two-inch intervals and a dibbler with pointed iron pegs made so as to fit the diameter and distance of the holes in the sheet of iron. By this means it is possible to obtain an exact number of plants per given area, and consequently reliable results can be obtained. Up to the present no trials of this nature, at any rate on wheat and barley, have been made in this Colony to determine accurately yield, rust resistance, stand, etc.

All the most promising varieties are being tried out as stated above; the remaining varieties are being tried out in what are called "rod rows," and any of these which show promise of quality, rust resistance, yield, stand, etc., will be given a further trial next season. Two varieties of a strong Canadian wheat brought over by Mr. L. Cripps, of Umtali, are at present showing up very well against the wheats grown in this Colony previously, and should they maintain their good growth, crosses will be made between these varieties and other varieties in order to try and breed a really suitable wheat for the Colony, for which at present there is a real need.

**Wheat Improvement.**—Hybridisation is one of the chief means of wheat improvement. This necessitates the operation of artificial cross-pollination. In this process the glumes (floral bracts) of the flower of the wheat which is to serve as the female parent are spread apart and the three stamens removed; this is done just before the anthers (pollen sacs) are mature. On the same day, or the following morning preferably, pollen is taken from the mature anther of another plant which is to serve as the male parent and placed between the glumes of the flower from which the stamens have been removed.

This operation requires extreme care and manipulation. If it is a hot day the pollen sacs burst while still in the ear of the plant which is to serve as the male parent, and consequently the pollen is lost; and on a cold day, when it is damp and there is no sun, there is great difficulty in getting the pollen sac at such a stage that it will burst when put on to the feathery stigma of the plant which is to act as the female parent. If pollination is done properly the pollen will reach the stigma branches of the emasculated flower, germinate and effect fertilisation. Immediately after the operation the ear is tied up in a waxed paper bag. This serves to make it absolutely certain that no other pollen can get access to the stigmas except that which was placed there. At the same time it is a convenient way of marking the ear which has been experimented upon. The cross is usually made both ways, each variety being used as pollen parent and as ovary parent. As soon as the cross fertilised seeds are ripe they are gathered and are sown the following season.

The plants which grow from the cross fertilised seeds are known as the first generation. It is characteristic of first generation plants to exhibit extraordinary vigour. This is the case with almost all first crosses, both in plants and animals. After several generations of careful selection one is then able to produce a plant which breeds true and exhibits all or nearly all of the good characteristics of both parents.

An excellent example of the practical application of Mendelian principles is afforded by the experiments which Professor Biffen has carried out at Cambridge.

Taken as a whole, English wheats compare favourably with foreign wheats in respect of their cropping power. But on the other hand they have two serious defects. As has already been stated, they are liable to suffer from the attacks of rust, and they do not bake into a good loaf. It was held that a hard wheat with a highly glutinous content could not be grown in the English climate, and most of the varieties imported deteriorated greatly in a very short time. However, Professor Biffen managed to obtain a hard wheat which kept its qualities when grown in England, but its cropping capacity was inferior to the soft English wheats and, like the latter, it was also subject to rust. However,

he also found one which was completely immune to rust, though in other respects it had no desirable quality to recommend it. After elaborate investigations he was able to show that the qualities of heavy cropping capacity, "hardness" and immunity to rust, can all be expressed in terms of Mendelian factors. As a result of this, in a few years he was able to build up a strain of wheat which combined the cropping capacity of the best English varieties with the hardness of the foreign wheats, and at the same time was completely immune to rust. This wheat has kept its qualities unchanged for many years now, and it and others produced since have exerted an appreciable influence on wheat growing in Great Britain.

At the end of the season, after the harvest has taken place, all data collected will have to be put to a statistical test to see whether there is any significance in the results. Should a really good wheat be produced in these trials there seems to be no reason at all why the requirements of the Colony should not be fulfilled, while possibly in the future an export trade might be built up.

It is well to bear in mind that all wheat-growing countries have had initial difficulties, not necessarily of the same nature as we have here, but these have all been overcome to a great extent. With this in mind the future of the wheat-growing industry should not present insuperable obstacles.

## SUMMARY.

1. It is possible to produce two wheat crops per annum in Southern Rhodesia. It will be necessary to breed up two types of wheat, one for summer cultivation and one for winter cultivation. The summer crop depends upon the rainfall, as also does the winter crop grown in moist vleis. A certain amount of wheat is grown under irrigation.

2. Wheat has an extensive root system, and in good soils will penetrate to a depth of four and even more feet. The water requirement, *i.e.*, the number of units of water absorbed to produce a unit of dry matter, is slightly greater than that of maize, but less than that of barley, oats, rye, potato or lucerne.

3. The stems are of the general grass type and are usually hollow, except in some varieties of the Macaroni and Poulard wheats.

4. The leaves are also of the general grass type.

5. The wheat flowers are arranged in spikelets. Fifteen to twenty fertile spikelets are the normal number on a head, but favourable conditions will be found to increase the number.

6. Flowering takes place during the daytime to the extent of about 86 per cent. Generally wheat is self-pollinated, but in this country, especially with the summer crop, it is possible that there is a fair amount of cross-pollination.

7. Wheat is usually harvested while in the full ripe stage; if left until the dead ripe stage, losses from shedding and shattering are very likely to occur. Wheat for planting purposes should be allowed to become dead ripe, as the vitality of the grain is greatest at this stage.

8. Wheat is grown in nearly every country in the world. The range of cultivation extends from well within the Arctic Circle to the Equator. The heavier loam soils are the best for wheat growing.

9. There are two kinds of wheat—hard and soft. Rhodesian wheats for the most part come under the class of soft wheats, and are not suitable for milling and baking. Experiments have now been started to try and produce a wheat which will pass all milling and baking tests and also to produce a variety which will be rust-resistant.

10. The annual requirements of the Colony are approximately 70,000 bags, only 6,000 being home-grown. Every endeavour should be made to meet the requirements of the Colony, which will increase as the population increases.

11. Wheat is one of the most valuable articles of diet. It is almost a complete food. Statistics have shown that people whose staple article of diet is wheat and its products are on the whole the most intelligent and virile of all.

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# Farmyard Manure.

We have received the following letter from Mr. S. Segal, of Kensington Farm, Bulawayo:—

"The article on 'Farmyard Manure,' by Mr. A. P. Taylor, in your March issue would have been more interesting to many Rhodesian farmers had he (Mr. Taylor) dealt with 'Kraal Manure' (manure deposited by cattle kraaled at night in the open with no 'litter' or concentrated foods and tramped over summer and winter for years), which can be seen in thousands of tons on nearly every. farm. How does this 'kraal manure' compare with the 'farmyard manure'? Also 'kraal manure ashes,' considering the difference in transport and the weeds that get destroyed by burning? Your advice direct will be welcome."

We have submitted the letter to Mr. A. P. Taylor, M.A., B.Sc., Government Agricultural Chemist, the author of the article which appeared in our March issue, who replies as follows:—

I am afraid that Mr. Segal exaggerates somewhat when he states that what he terms "kraal manure" as opposed to "farmyard manure" may be seen "in thousands of tons on nearly every farm" in Rhodesia. I am willing to admit that the very wasteful system of keeping cattle in kraals at night in the open without litter of any sort being added is still persisted in by some Rhodesian farmers, following the old

Cape habit, but the custom is gradually dying out, and on the more up-to-date and modern farms is never seen. In addition, Mr. Segal is surely not serious when he says that "thousands of tons," which means the accumulation of several years, are lying on so many farms, *still in the kraals.* Surely it would have been more profitable to have given them to the soil for the use of the plants rather than to keep them where they are!

If Mr. Segal refers to my article on "Farmyard Manure" in the March issue of the Journal, page 217, he will see that I classed "kraal manure" and "farmyard manure" as synonymous terms, and ignored this "litterless" type of manure intentionally. One of the principal purposes of the article was to indicate how to make best use of the valuable excreta of animals, and reference to this wasteful method would have defeated to a considerable extent the aim in view, for I make bold to say that it is never an impossibility to add litter or bedding of some kind—ordinary veld grass, for instance—to the kraals, wherever situated.

A comparison between "kraal manure," as Mr. Segal understands it, and farmyard manure is difficult to make, the odds being so very largely in favour of the latter, but a few observations might be of interest.

In the first place, the actual percentages of nitrogen, phosphates and potash in "kraal manure" will, for a short time, be higher than those in a sample of "farmyard manure" from the same type of animal. It is obviously impossible to give definite figures owing to the differences caused by variations in food, etc., but one sample analysed recently in the Government Laboratory showed nitrogen 1.02 per cent., phosphoric oxide .61 per cent., potash 1.5 per cent., corresponding to 20, 12, 30 lbs. per ton respectively, figures considerably higher than those given in my article as rough average figures for a good farmyard manure, the difference being, of course, accounted for by the lack of the all-important litter.

Under the conditions to which "kraal manure" is exposed, however, these percentages rapidly decline, and another analysis from our records of old "kraal manure" shows only .3 per cent. nitrogen, 1.0 per cent phosphoric oxide and .09 potash, corresponding to 6, 20, 2 lbs. per ton

respectively. This is what invariably happens—the greater part of the valuable constituents, nitrogen and potash, is removed by exposure, volatilisation and leaching, and a considerable part of the phosphoric oxide in addition. Mundy, quoting A. D. Hall, states with reference to cow manure, than when no litter is used 59 per cent. nitrogen is lost from these causes, while when abundant litter is used only 40.8 per cent. of nitrogen escapes, and even this figure could, I think, be lowered by more careful treatment still. Surely approximately 20 per cent. of the nitrogen content of the original manure is worth considering when it means only the adding of some litter.

Apart from this all-important aspect of its conservation of the essential food elements, the litter, as pointed out in the original article, has such a valuable effect, on the physical properties of the soil that its omission in the "kraal manure" is really unjustifiable and the value of the latter to the soil lowered by an immeasurable amount, and one which cannot be stated in terms of figures or mealie bags. The bulk of the manure is greatly increased, matter is added which will ultimately become humus, and some of it also becomes plant food. There are other points, too, already mentioned in the original article.

Mr. Segal's reference to "kraal manure ash" is rather beside the point here. Let me say, however, that of course it contains no nitrogen and very little phosphoric oxide or potash, but fairly high percentages of lime and silica. I cannot give figures, as compositions vary so much, but if the old method of making kraal manure is wasteful, then there is not a superlative strong enough to express the waste which deliberate burning of it entails.

The "weed" scare is in reality a myth and can be overcome with little difficulty. Where the "kraal manure" has been kept in the kraals "for years" there will be little danger of much weed growth on the lands when it is ultimately spread out, but if the stuff is put out direct, then weeds may certainly be expected. A little extra cultivation will eradicate these, however, or the manure may be given the intermediate step of being put in pits or heaps between removal from the kraals and application to the soil.

I am obliged to Mr. Segal for raising these points, and have replied in full, as I feel the matter is one of general interest. The sooner Rhodesian farmers realise the great value of their animal excrements, and the importance of ensuring that "farmyard manure" and "kraal manure" mean the same thing, namely the former, by whichever of the two terms they care to call it, the better for themselves and for the country at large.

# Farmers' Days for Rhodesia.

## VISIT TO MATOPO FARM.

Farmers' Day at the Matopo Farm, held on the 19th March, was almost marred by unfavourable weather. Heavy and continuous rain had fallen throughout Matabeleland on the two previous days, and it was still raining at 6 a.m. on the 19th; the sun, however, then came out, and the day remained fine until it was time to adjourn to "Hull's homestead" for tea. Many of the roads leading to the farm (as well as those on the farm) were exceedingly heavy, but in spite of this fact a gratifyingly large attendance of farmers, their wives and friends had made their appearance by 10.30 a.m. Not a few had temporarily abandoned the motor car in favour of the ox wagon as a slower but more certain means of transport over flooded spruits and miry farm tracks.

The visitors were welcomed by officials of the Department of Agriculture and by Mr. Mainwaring, the Farm Manager, and then moved off to inspect the buildings and pigs and a display of cereal crops staged in the implement shed. These crops consisted chiefly of varieties of wheat, oats and barley grown under irrigation on the experimental plots. Attached to each exhibit were full particulars of the circumstances under which the cereals had been grown and their yield per acre.

Much interest was evinced in the new buildings erected with farm labour since last year; a plan of each block as

prepared by the agricultural engineers was shown, and alongside this was given the exact cost of erection in detail.

Following early morning tea, a short drive was taken through the farm to inspect the crops. Unfortunately the fields on this farm are somewhat scattered, and owing to the very wet condition of the roads it was only possible to reach the areas fairly near the homestead. Maize was observed to be cobbing very well, but the stand of plants was on the whole thin. Dolichos beans showed to great advantage. The experimental area was next visited, and here small plots of almost every summer crop suited to Matabeleland conditions were seen. The Farm Manager explained the special value or otherwise of each crop or variety, and at the same time gave much other useful information on similar matters.

Luncheon was then taken in "Hull's homestead," the attendance having by this time increased to about 170. Appropriate speeches were made by the Hon. R. A. Fletcher, Minister of Agriculture, and by Mr. Harley, on behalf of the farming community. Mr. Simson, a prominent farmer from New Zealand, who is touring Rhodesia, also spoke in both an instructive and amusing strain, and impressed on all present the advantages of mixed farming. The afternoon was devoted to lectures and discussions, the first speakers being Mr. J. R. Corry, Government Dairy Expert, stationed in Matabeleland, who was followed by Dr. Little, Senior Poultry Expert to the Department of Agriculture. Mr. C. S. Jobling, M.L.A., had kindly consented to speak on the fattening of steers, and his very practical talk was followed with the keenest interest, a bunch of bullocks which will be fattened on the farm this coming winter being used to illustrate his remarks. Mr. Jobling said he was not going to assure them that fattening was profitable—that was a matter they must decide for themselves—but on those who wished to adopt this line of farming he urged the importance of obtaining, in the first place, bullocks of really good type, and secondly, of making full and adequate provision for the necessary food supplies to permit of a well-balanced ration. An ample supply of clean water freely available was an essential.

Mr. Martyn Green, of Bulawayo, next spoke on the subject of the need for co-operative organisation amongst the

Farmers' Day at Matopos, 19th March, 1929

dairy producers of the Colony, and on conclusion of his address tea was served, after which Mr. Henkel, Senior Forest Officer, concluded the day's proceedings with a simple but forceful talk on forestry problems in Rhodesia. He commented on the excellent growth made by the trees planted on the farm during the last three years, and urged that all land owners should adopt the gospel of the "three P's," namely:—

*Protect* the indigenous vegetation from injury by fire, particularly on the hills and the catchment areas of springs and dams. Such protection will increase the water supply and afford valuable reserves of pasture in dry seasons.

*Preserve* the better kinds of timber trees by preventing indiscriminate felling. Many kinds of indigenous trees, by giving them a little judicious pruning, yield valuable poles and building timber for general farm purposes. Sooner or later these preserved trees become a valuable asset. Do not waste any wood.

*Plant* a plot of rapid-growing timber trees to supply tall, straight poles. Plant on the deepest soil on the farm. Failing any other suitable site, plant in deep soil near streams. The two red gums (*Eucalyptus rostrata* and *Eucalyptus tereticornis*) are old friends that will not fail. Plant a range of trees and shrubs around the homestead so as to beautify the surroundings and afford shelter from wind. Such plantings increase the value of the farm and beautify the homestead.

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## THE GWELO FARMERS' DAY.

Thanks to the efforts of the Gwelo Municipality, in conjunction with the local farmers' association and the District Agricultural Adviser, Mr. Hubbard, a Farmers' Day at Gwelo was arranged for the 27th March. The primary object of the gathering was to inspect the work in progress on the sand veld and red soil demonstration fields farmed by the Municipality, under the supervision of the Division of the Chief Agriculturist, and also to hear addresses from other officials of the Department who were present. As a point of interest it might be stated that reports on the experiments carried out on these farms have from time to time appeared

in the *Rhodesia Agricultural Journal* and are available in bulletin form.

Farmers from all parts of the Midlands—Somabula, Daisyfield, Selukwe, Hunter's Road, Que Que, Umvuma, Lalapanzi, etc.—were present, the attendance, including farmers' wives, numbering 110.

Meeting at the Midlands Hotel at 9.45 a.m., the visitors proceeded to the sand veld demonstration plots, which were reached at about 10.15, when over 80 farmers and their wives were present to inspect the crops of this area. About an hour was devoted to discussing problems in connection with the farming of sand veld land, after which a move was made to a picnic spot on the Selukwe road, adjacent to the demonstration plots on the red soil area. Arrived there, an excellent tea was enjoyed, after which the Mayor (Mr. M. Jacobson) welcomed the visitors.

In doing so Mr. Jacobson explained the object of the Farmers' Day—to show the results obtained on the experiment stations and what the Midlands could do. He pointed out that the soil on the stations was no different from any other soil in the district; in fact, so far as the sand veld area was concerned, he had been assured by Major Mundy that it was the worst soil in the district. The station, he continued, had been opened in the season 1923-24, largely through the instrumentality of Major Mundy. Since the commencement it had been supervised by Mr. W. Hopkins (under the direction of the Agricultural Department), who had efficiently and ably carried out his duties, as results showed. Mr. Hopkins had done as much as any man could possibly have done in looking after the crops, and much praise was due to him.

Mr. Jacobson expressed his appreciation and pleasure at the interest that had been evinced by those present, which went to prove that the town was entitled to spend the money they were doing in organising the Farmers' Day.

Mr. J. Watkinson replied on behalf of the agricultural community, and moved a vote of thanks to the Mayor and Town Council for what they had done in establishing and maintaining the experiment station.

Farmers' Day at Gwelo, 27th March, 1929 The Mayor welcoming the visitors

Melrose Hetta at Gwebi on Farmers' Day. Calved 16th January, 1929. First 30 days gave an average of 63 lbs. milk per day, testing 3.57 per cent. Production equal to 68 lbs. butter fat in 30 days.

The Chief Agriculturist also paid a tribute to the Gwelo Municipality, on behalf of the Government, the Agricultural Department and himself, for the manner in which the experimental work had been undertaken and for the able way in which it had been conducted under the supervision of Mr. Hopkins. He expressed the regret of the Minister of Agriculture, Mr. Fletcher, that he had not been able to be present on this occasion owing to extreme pressure of work.

Following this, two extremely interesting lectures were delivered, the first by Mr. Taylor, Assistant Agricultural Chemist, who spoke on artificial fertilisers and the plant food requirements of crops. After this, Mr. Wilkinson, District Forest Officer for the Midlands, who is now stationed at the Mtao Forest Reserve, addressed the meeting on the subject of forestry in connection with agriculture, and intimated that it was the intention of the Department before long to introduce Farmers' Weeks at the Forest Reserve, at which farmers could attend and study practical questions of afforestation in Southern Rhodesia.

The next item on the programme was an *al fresco* lunch, which was much enjoyed by all, after which a move was made to the red soil area, by which time the attendance had increased to 110.

The work in progress was explained by the Chief Agriculturist and by Mr. Hubbard, District Agricultural Adviser. The crops on this area are very fine this season, and offer a remarkable demonstration of the efficacy of working arable land on a definite system of rotation crops, combined with the use of farm manure, green manures and artificial fertilisers.

After a lengthy discussion of the various points which might be raised in connection with farming land of this description, the party returned to a welcome tea. Unfortunately a number of farmers had by this time left, and it is to be hoped that next year the visitors will endeavour to remain until the conclusion of the day.

After tea, Mr. Corry, Dairy Expert for Matabeleland, spoke in a very practical and useful manner on the feeding of dairy cattle, and emphasised the fact that in his opinion there were large numbers of cows in Rhodesia, at present

regarded as unprofitable or semi-profitable milk producers, which could, with proper feeding and attention, be converted into highly profitable animals.

The Chief Agriculturist concluded the afternoon's proceedings with a few brief remarks on the lessons which could be learned from these two experiment stations. He emphasised the importance of the maintenance of an adequate supply of organic matter in the soil, either by the application of farm manure or by ploughing under green manure crops, pointing out that if this maintenance of the organic matter supply was neglected, a state would be reached when the soil would be incapable of responding to any application of artificial fertiliser. He urged on all those present engaged in farming to lose no time in getting down to a definite system of land management which would include the above principles of recognised good farming in every agricultural country in the world. He added that during the last twelve months his division of the Agricultural Department had supplied schemes of rotation and green manuring for a number of farmers in different parts of the country, and he hoped that all those present would not fail to place themselves in communication with him and give his division the opportunity of offering suggestions for the systematic cropping and manuring of their land. He was satisfied that the needs of every farmer in this respect could be met in a practical and economic manner, and that by working their land in this way they would not only appreciably increase their yields and their profits, but would find the management of their arable areas a very much simpler matter than haphazard hand-to-mouth methods.

Major Mundy closed his remarks by offering a vote of thanks on behalf of those present to the Mayor and Town Councillors of Gwelo for the admirable arrangements which had been made for the day for the entertainment of visitors. In this connection he wished in particular to thank Mrs. Jacobson and the ladies who had so ably arranged and dispensed the refreshments.

## FARMERS' DAY AT GWEBI.

The Farmers' Day at the Government Farm, Gwebi, held on the 30th of March, proved an unqualified success,

Farmers' Day at Gwebi, 30th March, 1929. The Chief Agriculturist explaining systems of croppings.

Mimosa Clara X. at Gwebi Farm on Farmers' Day. Calved 25th June, 1928. First 28 days gave 72 lbs. milk per day. During present lactation period of 246 days (unfinished) has yielded 15,607 lbs. milk and 474.5 lbs. butter fat testing 3 per cent.

the attendance only just falling short of 200, which is a considerable increase on any previously registered attendance at a Farmers' Day in Rhodesia. The date chosen for this event was not convenient to a number of farmers, owing to the school holidays, and had it not been for this fact there would undoubtedly have been a considerable number of additional visitors to the farm. A satisfactory feature, however, was the fact that amongst those present were to be seen a very considerable number of new settlers and young farmers, while on the other hand many familiar faces of the older established farmers were not in evidence for the reason already given. Visitors reached the farm from as far afield as Sinoia and the Ayrshire-Sipolilo area on the one side to Gatooma on another, and from Odzi and Umtali on the third side; while more adjacent districts, such as Marandellas, Mazoe, Salisbury, Hartley, etc., were well represented.

Morning tea was served shortly after 10.30 a.m., at the conclusion of which Mr. Mundy, Chief Agriculturist, welcomed those present this year, and gave particulars of the programme which it was proposed to carry out during the day. Following this, Mr. McLoughlin, Assistant Agriculturist, who has recently been acting as manager of the Gwebi Farm, gave some interesting particulars in regard to the operations of the farm during the last few years. He pointed out that on an average just under £200 a year had been spent on the purchase of artificial fertilisers, of which bone and superphosphate was most generally used.

In 1926-27, 300 acres were under maize, and yielded 11 bags an acre. In 1927-28 the acreage to maize was increased to 420 acres, and the average yield that season was 11½ bags per acre. During the present year 730 acres were under crop, of which 420 acres were under maize, the balance being planted to various stock feeds and legumes for green manuring. Although the past few months have been too wet for the best results on the Gwebi Farm, the crop yields this season are not expected to fall short of those of the two previous years. Each large block of arable land is divided up into suitable sub-divisions, and each section is worked on a four-course rotation; in all, eight different rotations are being followed. Generally speaking, the practice is to use farmyard manure at the rate of seven to eight tons per

acre once every fourth year, and in addition to apply artificial fertilisers in two years out of four. Alternatively, on land which is too remote from the homestead to be treated with farm manure, a green manure crop is grown once in four years and ploughed under, and again two applications of fertilisers are given during the cycle.

The Gwebi Farm is now designed by the Government as a commercial demonstration farm, and the object of those responsible for its management is to run it on what is regarded by the Department of Agriculture as the most approved lines for a mixed farming proposition in Mashonaland. It is believed that the methods of land management employed and the methods followed in the handling of the dairy herd and the pigs are practical examples of the general lines upon which farming propositions of this description should be organised. It is not claimed that Gwebi methods are the best in all instances, and practical farmers will quite likely be able to improve upon them, but the systems followed suit the requirements of this particular farm, and, as might be judged from the general appearance of the live stock and crops, are yielding highly satisfactory results.

The visitors were informed that the average number of native labourers employed on the farm during the year was 90, of whom 70 were employed on work in connection with arable farming and development and the remaining 20 on live stock. The average native wage was said to be 17s. 6d., in addition to which, of course, the "boys" received the usual ration of meat once a week, maize meal, a small quantity of salt and, when available, monkey nuts, beans, sweet potatoes, etc.

At about 11.15 a.m. the party moved off to inspect the crops, and the long string of over 50 motor cars threading its way through the fields was a really imposing sight. Halts were made at frequent intervals, and the Chief Agriculturist and the manager of the farm generally explained the various rotational systems which the visitors saw before them and the manner in which these courses were expected to maintain the fertility of the soil. General satisfaction was expressed on the good condition of all the crops, and numerous questions were fired at all members of the Department who were present. The homestead was reached at about

1 o'clock, where a light lunch was provided under the shade of some convenient trees. On conclusion of the lunch, the Minister of Agriculture welcomed all those present and expressed his gratification at so large an attendance. Mr. Basil Christian returned thanks on behalf of the farming community.

The next item on the programme was a parade of some of the Friesland cattle, whereat the acting manager gave particulars of the milk output of some of the more outstanding animals. In this connection he stated that the herd now numbered about 117 head of all ages, and that during January the 23 cows which were in milk had given a herd yield for that month of 2,466 gallons. In February, 24 cows were in milk, and the herd yield had increased to 2,732 gallons. At the date of speaking there were 27 cows in milk, and the yield for that month was 3,137 gallons, or an average of 3.9 gallons per cow. Throughout the year 1928 there had been an average of 30 cows in milk per month, and the monthly output on the average had amounted to 2,000 gallons. A large proportion of the herd are animals of two years or under, which accounts for the small number of cows in milk.

Mr. Hamilton, the Dairy Expert, next gave a short address on the hand rearing of dairy cows, which was carefully listened to by a large number of the visitors, after which a move was made to the lunch place, where Mr. Needham, accountant of the Agricultural and Veterinary Departments, gave a short talk on farm accounts and costings, explaining in some detail the methods which were now being followed on the Gwebi Farm for recording costs of the farm as a whole and of the different departments of it. Mr. Noaks, secretary of the Rhodesia Agricultural Union, raised a point of interest on capital invested on the farm, and was assured that when costings are published due allowance will be made for interest on the capital valuation of the farm equipped as it stands to-day.

The pigs were not seen by the majority of the visitors, owing to the fulness of the programme, but they are well worthy of a few remarks. The pigs kept are Middle Whites and a cross between that breed and the Large Black. A fine litter of ten cross-bred baconers caught the eye, it being

stated that the pigs were ready for the factory at six months and were to be sent in the following week. It is found at the Gwebi Farm that the cross-bred pigs mature earlier than the pure-bred Middle White or Large Black, and it is a cross that can be strongly recommended to farmers who house their pigs well or run them in paddocks adequately supplied with shade.

Following Mr. Needham's address, a move was made to the cattle feeding pens, where 35 head of bullocks, drawn from the Rhodes Inyanga Estate, were to be seen. These bullocks are being fattened for shipment to Great Britain about the middle of May, and have so far only been on the Gwebi Farm about three weeks. The Chief Agriculturist at this point gave an address on "Feeding for Beef," in the course of which he pointed out that under normal conditions in Rhodesia it was not safe to anticipate large profits from feeding cattle for this purpose. On the other hand, however, it was a system of farming which could be strongly recommended because of the indirect profits which it affords. Firstly, by providing an opportunity for turning over money fairly rapidly, even though possibly it only gave a small profit. Secondly, as a means of manufacturing farm manure which was so necessary for the maintenance of soil fertility; and thirdly, as affording a reason for the growing of rotation crops and likewise an outlet for many bye-products of arable farming which would otherwise be put to no good purpose. He explained the type of bullock which it was necessary to breed or buy in order to feed profitably, and emphasised the importance of only putting up animals which, when fat, could be relied upon to pass the embargo weight for export to the Union. The desirability of polled or de-horned bullocks was drawn attention to.

The question of rations during the feeding period was discussed, and stress was laid on the necessity for a well-balanced ration, for variety in the feeds and for an adequate and clean supply of water to the animals. Alternative methods of feeding, namely, in small paddocks, in open yards or tied up by the head, were touched upon, and the relative advantage of each system was explained. The need for shade in the pens or paddocks, particularly during the hotter months of early spring, and for some shelter from cold winds in mid-winter, were emphasised.

Time did not permit of visitors being shown the system of paddocking on the farm. More than half the farm is sub-divided into paddocks of from 75 to 150 acres in extent, and, similar to the experience on many farms in the Colony, the grass has improved wonderfully in consequence. At the time of the Farmers' Day the grass had recently been cut for hay, and there was a verdant mantle of sweet grass of high feeding value. One of the paddocks planted several years ago with seed of several selected native grasses grown at the Agricultural Experiment Station, Salisbury, has done exceptionally well. The dry Friesland cows and young stock run in these pastures day and night, and it is found that they require comparatively very little supplementary feed.

The day's programme concluded, a well-earned tea was partaken of, the visitors rapidly dispersing and commencing the in many cases long return journey to their farms. Before taking leave of the members of the Department of Agriculture present, the majority of the visitors expressed the opinion that the day had been a highly interesting and instructive one, and many stated that they were going back to their districts with every intention of persuading as many as possible of their fellow farmers who did not go this time to visit the farm next year.

Three Farmers' Days have recently been held, namely, that of the Matopo Farm on the 19th March, the Gwelo Farmers' Day on the 27th March and now Gwebi Day. The total attendance at these events has been just over 500, and this number of farmers, therefore, have been able to profit by these opportunities of getting into close touch with officials of the Department of Agriculture and of seeing the manner in which work on the farms and demonstration stations of the Department is conducted.

# Custom and Customs.

Great Britain allows free of duty one-half pound of cigars or tobacco.

France permits less than twenty cigars or twenty cigarettes to enter free, provided they are declared. Playing cards and matches are prohibited.

Belgian travellers will find Belgian authorities lenient with tourists who do not carry an excessive amount of tobacco (twenty-five cigars in opened box allowed) or cigarettes. Matches and playing cards are subject to duty.

Holland.—Similar to Belgium.

Italy.—All tobacco must be declared. Playing cards and matches are dutiable, but the examination is lenient.

Germany.—Tobacco in any form is liable to duty.

Switzerland.—Officials are exceedingly kind to tourists and permit the free entry of practically all personal belongings. One should declare, however, any excessive amount of tobacco.

Spain allows all personal belongings to enter free. The women inspectors at the French-Spanish frontier are renowned for their thoroughness in examinations. Tobacco and matches should be declared.

Norway and Sweden permit free entry of all personal belongings. Tobacco in quantities is taxable.

Passengers west-bound receive from their stewards or the purser a declaration form for recording dutiable goods being brought into the United States or Canada. The head or senior member of a family can fill out one form for the family, which will be checked by the Customs inspectors when baggage is examined at the pier.

A free allowance of $100 is granted. Adult passengers may bring in fifty cigars or three hundred cigarettes or three pounds of tobacco.—("Tobacco Journal.")

# Movements of New Settlers.

The following new settlers arrived in the Colony during the month of March, 1929:—

—— de Barry.—Arrived from Great Britain 1st March, 1929, and is staying with friends in Salisbury.

C. R. Lee.—Arrived from Great Britain 10th March, 1929, and proceeded to Captain Howland for a period of training.

Mr. and Mrs. K. Bickley and family.—Arrived from Great Britain 14th March, 1929, and are staying with friends in Bulawayo.

D. H. Giffard.—Arrived from New Zealand 15th March, 1929, on tour of inspection.

Captain and Mrs. E. H. Allott and family.—Arrived from Great Britain 20th March, 1929, and proceeded to Messrs. Hanmer Bros., Melsetter, for a period of training.

Dr. T. R. Thomson.—Arrived from Great Britain on 25th March, 1929, and proceeded to Lilfordia Farm, Salisbury.

Mr. and Mrs. W. Thyer.—Arrived from Australia on tour of inspection.

# Seed for Sale, Gwebi Farm.

Kinvarra Oats ... ... ... ... ... per 100 lbs. 25s.

Price is f.o.r. Gwebi. Cheques should be made payable to "Gwebi Farm." Orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury.

# Southern Rhodesia Veterinary Report.

## February, 1929.

### AFRICAN COAST FEVER.

A fresh outbreak occurred on the farm Avontuur, Melsetter district, immediately adjoining the existing centres of infection; three deaths. At the Morgenson infected centre, which consists of the farms Enhoek and Canterbury, seven deaths occurred.

### CUTANEOUS MYIASIS (SCREW WORM) OF CATTLE.

Reported as prevalent in the Bindura, Mrewa and Macheke areas. A few cases reported from the Bulawayo and adjoining districts.

### SWEATING SICKNESS OF CALVES.

Reported as prevalent in the Salisbury, Bindura, Mrewa, Umtali, Inyanga and Gwelo districts. A few cases in the Marandellas and Victoria districts.

### HORSE-SICKNESS.

The following mortality was reported:—Mazoe, 2; Bindura, 1; Hartley, 2; Enkeldoorn, 2; Que Que, 1; Rusape, 3; Bulawayo, 1; Melsetter, 7.

### SCAB.

Two infected flocks reported from Melsetter district.

### TRYPANOSOMIASIS.

A fresh centre of infection reported from the Gatooma area. Several deaths in cattle reported from the Melsetter district.

## IMPORTATIONS.

From Union of South Africa:—Cows, 42; horses, 6; donkeys, 18; sheep, 900; goats, 246; pigs, 15. One cow reacted to the tuberculin test and was slaughtered.

## EXPORTATIONS.

Cattle.—To Union of South Africa for local consumption, 84. To Belgian Congo:—Slaughter, 656. To Portuguese East Africa:—Slaughter, 12.

Miscellaneous.—To Northern Rhodesia:—Pigs, 4. To Belgian Congo:—Pigs, 32. To Union of South Africa:—Pigs, 52.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

# Southern Rhodesia Weather Bureau.

## MARCH, 1929.

**Pressure.**—Barometric pressure was generally high during the month, being highest at Fort Victoria with 0.024 ins. above normal and lowest at Salisbury with 0.002 ins. below normal.

The country was visited by four high pressure systems and three low pressure systems during the month. Of the highs the first was off the south coast from the 1st to the 5th, it then moved up the coast to the Mozambique channel, and was not in evidence on the 9th. The second high was along the south coast from the 8th to the 12th; it then moved up the east coast and departed on the 18th. The third high was off Mozambique and Beira from the 16th to the 21st. The fourth high signalled the end of the rainy season; it showed first at Capetown on the 21st, was strong off the south-east coast on the 22nd; on the 23rd it moved inland, and appears to have moved up right through Rhodesia. Highs of this type have been very rare this season.

The first low was active in the west from the 1st to the 14th. On the 1st a complementary low lay off Durban; on the 2nd the equatorial low extended into Rhodesia, withdrawing on the 3rd; it then extended down the west coast on the 5th. On the 6th a complementary low showed off the Cape; this moved round and was off Lourenco Marques on the 8th. On the 9th the equatorial low extended over the whole of Rhodesia, and remained in this position with minor fluctuations until the 13th, when it withdrew to the west. A further low appeared on the south coast on the 14th, with a trough to the north; this low moved round the coast up to the 17th, when the trough gave place to a ridge of high pressure; this ridge persisted until the 25th, when a minor movement of lows took place, resulting in a weak extension of the equatorial low on the 27th. Little rain resulted.

**Temperature.**—The mean temperature for the month was low, varying from 4.0° F. below normal at Riverdene North to 0.5° F. above normal at Sipolilo. The mean maximum temperatures were very low, varying from 8.7° F. below normal at Riverdene North to 0.1° F. above normal at Sipolilo. Mean minimum temperatures were generally high, varying from 1.7° F. above normal at Enkeldoorn to 1.2° F. below normal at Riverbank. Relative humidity was generally 5 to 10 per cent. above normal.

**Rain Periods.**—Showers fell fairly continuously during the month up to the 24th, with maximums on the 4th and 5th, 10th and 11th, 17th and 18th. On the 1st and 2nd, showers were recorded in the north; on the 3rd, showers were general in the south, becoming general on the 4th and 5th; on the 6th, showers were general in the north, with scattered showers on the 7th. Showers were fairly general on the 8th, and general in the south on the 9th, becoming general on the 10th and 11th. On the 12th the weather cleared in the south, and showers were confined to Mashonaland up to the 14th. Scattered showers fell on the 15th and 16th. On the 17th and 18th showers were again general. From the 19th to the 24th scattered showers were recorded, and during the remainder of the month isolated showers occurred.

**Rainfall.**—The rainfall for the month amounted to 6.28 ins., as compared with the average of 4.17 ins. The seasonal total to the end of March was 34.25 ins. The rainfall of March was distributed as follows:—

| | Rainfall, March, 1929, ins. | Average March, ins. |
|---|---|---|
| Zone A ... ... ... ... ... ... | 5.15 | 3.31 |
| ,, B ... ... ... ... ... ... ... | 3.54 | 2.93 |
| ,, C ... ... ... ... ... ... ... | 7.06 | 4.64 |
| ,, D ... ... ... ... ... ... ... | 7.18 | 5.03 |
| ,, E ... ... ... ... ... ... ... | 8.29 | 4.90 |
| ,, F ... ... ... ... ... ... ... | 14.80 | 8.78 |

From the above it will be seen that the rainfall was in excess in all zones.

# RAINFALL.

| Station. | 1929. Feb. | 1929. March. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| Zone A.: | | | | |
| Bubi— | | | | |
| Bembesi Railway ... | 7.92 | 6.47 | 33.51 | 22.75 |
| Glenarton ... | 6.14 | ... | ... | 24.26 |
| Inyati ... | 6.21 | 3.15 | 34.88 | 23.46 |
| Judsonia ... | 7.53 | 4.55 | 30.96 | n.s. |
| Martha Farm ... | 7.17 | 4.91 | 28.41 | 19.08 |
| Nduba Farm ... | 4.96 | ... | ... | n.s. |
| Shangani Estate ... | 7.80 | 5.23 | 32.97 | 24.51 |
| Bulalima-Mangwe— | | | | |
| Centenary ... | ... | 7.23 | ... | n.s. |
| Kalaka ... | 8.24 | 4.42 | 27.61 | 22.41 |
| Riverbank ... | 7.94 | 3.64 | 24.87 | 24.03 |
| Solusi Mission ... | 7.75 | 7.52 | 26.83 | 22.75 |
| Bulawayo— | | | | |
| Fairview Farm ... | 6.44 | 4.36 | 29.62 | 21.24 |
| Keendale ... | 5.83 | 4.27 | 26.59 | 21.20 |
| Lower Rangemore ... | 5.23 | 4.02 | 30.79 | 22.93 |
| Observatory ... | 7.43 | ... | ... | 22.69 |
| Waterworks ... | 6.11 | 9.14 | 34.70 | 23.22 |
| Gwelo— | | | | |
| Brockenhurst .. | 6.54 | 4.88 | 31.94 | n.s. |
| Frogmore ... | 7.48 | 5.70 | 36.82 | n.s. |
| Gwelo Gaol ... | 6.13 | 5.95 | 34.02 | 25.11 |
| Riversdale Estate ... | 8.04 | ... | ... | 28.47 |
| Somerset Estate ... | 9.63 | ... | ... | 24.37 |
| Insiza— | | | | |
| Orangedale ... | 8.70 | 5.42 | 33.05 | 26.36 |
| Shangani ... | 5.59 | 4.33 | 31.36 | 23.23 |
| Thornville ... | 5.89 | 4.32 | 33.06 | 23.44 |
| Nyamandhlovu— | | | | |
| Gwaai Reserve ... | 6.40 | 3.39 | 29.54 | 23.97 |
| Gwaai Siding ... | 5.73 | 3.16 | 29.09 | n.s. |
| Naseby ... | 9.43 | 3.81 | 28.91 | 22.36 |
| Nyamandhlovu Railway ... | 5.57 | 5.51 | 27.53 | 21.96 |
| Sebungwe— | | | | |
| Gokwe ... | 5.00 | 7.89 | 35.27 | 29.77 |
| Umzingwane— | | | | |
| Springs ... | 7.21 | 4.22 | 30.46 | 23.56 |
| Wankie— | | | | |
| Dett ... | 4.96 | 3.83 | 32.59 | 22.21 |
| Ngamo Railway ... | 4.04 | 5.51 | 26.59 | 25.52 |
| Rosslyn ... | 7.55 | 1.56 | 25.69 | n.s. |
| Sukumi ... | 5.67 | 3.24 | 32.75 | 26.92 |
| Tom's Farm ... | 4.97 | 3.17 | 34.39 | n.s. |
| Victoria Falls ... | 2.93 | ... | ... | n.s. |
| Victoria Falls Railway ... | 2.89 | 3.69 | 23.95 | 27.11 |
| Wankie Hospital ... | 3.33 | 2.14 | 22.20 | 22.70 |

## RAINFALL—(*Continued*).

| STATION. | 1929. Feb. | 1929. March. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE B.: | | | | |
| Belingwe— | | | | |
| Bickwell ... | 9.25 | 5.78 | 29.77 | 22.12 |
| Sovelele ... | 9.42 | 3.86 | 28.73 | 20.41 |
| Tamba ... | 9.31 | 1.61 | 23.28 | 18.31 |
| Wedza .. | 11.06 | 5.73 | 29.36 | 23.11 |
| Bulalima-Mangwe— | | | | |
| Bruwapeg ... | 7.18 | 2.76 | 19.51 | 21.11 |
| Edwinton ... | 9.02 | ... | ... | 21.03 |
| Empandeni ... | 6.71 | 4.31 | 24.78 | 21.06 |
| Fallowfields ... | 7.51 | 4.39 | 24.37 | n.s. |
| Garth ... | 9.06 | 3.14 | 32.03 | 25.16 |
| Maholi ... | 9.89 | 3.04 | 31.22 | 27.22 |
| Retreat ... | 6.94 | ... | ... | 20.79 |
| Sandown ... | 7.16 | 6.75 | 31.14 | 25.71 |
| Semokwe Reserve ... | 6.90 | 2.56 | 19.77 | n.s. |
| Tjankwa ... | 7.62 | 3.78 | 32.82 | 26.76 |
| Tjompani ... | 9.44 | 3.86 | 40.19 | 24.10 |
| Chibi— | | | | |
| Bubye ... | 6.45 | 2.53 | 16.94 | 14.63 |
| Mtendelende ... | 6.26 | 3.90 | 24.00 | 20.35 |
| Nuanetsi Homestead ... | 4.40 | 3.83 | 22.54 | 15.75 |
| Nuanetsi N.C. ... | 4.00 | 2.51 | 24.05 | n.s. |
| Gwanda— | | | | |
| Gwanda Gaol ... | 8.44 | 3.67 | 28.35 | 20.14 |
| Mazunga ... | 5.61 | ... | ... | 16.00 |
| Mtetengwe ... | 4.24 | ... | ... | 12.23 |
| Tuli ... | 6.71 | 1.64 | 20.13 | 13.42 |
| Insiza— | | | | |
| Albany ... | 7.55 | 4.20 | 30.47 | 23.58 |
| Filabusi ... | 8.51 | 3.53 | 26.92 | 21.25 |
| Fort Rixon ... | 6.34 | 3.47 | 26.25 | 21.88 |
| Inyezi ... | 8.41 | 8.86 | 34.76 | 22.52 |
| Lancaster ... | 9.13 | 5.26 | 30.73 | 25.11 |
| Scaleby ... | 6.85 | 9.99 | 30.61 | n.s. |
| Wanezi Mission ... | 8.10 | 6.29 | 31.67 | n.s. |
| Matobo— | | | | |
| Bon Accord ... | 10.24 | 2.71 | 26.96 | n.s. |
| Fort Usher ... | 10.21 | 5.64 | 32.21 | n.s. |
| Holly's Hope ... | 9.53 | 3.21 | 28.49 | 20.88 |
| Longsdale ... | 8.05 | 6.47 | 32.20 | n.s. |
| Matopo Mission ... | 8.93 | 4.42 | 33.78 | 25.03 |
| Mtshabezi Mission ... | 6.36 | 3.66 | 27.02 | 21.29 |
| Rhodes Matopo Park ... | 9.93 | 4.26 | 31.09 | 22.82 |
| Umzingwane— | | | | |
| Balla Balla .. | 8.34 | ... | ... | 23.70 |
| Essexvale .. | 10.62 | 3.94 | 34.16 | 23.90 |
| Hope Fountain .. | 8.48 | 5.69 | 34.08 | 25.75 |

## RAINFALL—(*Continued*).

| Station. | 1929. Feb. | 1929. March. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE C. : | | | | |
| Charter— | | | | |
| Bushy Park ... | 7.30 | 6.91 | 36.96 | 30.26 |
| Enkeldoorn ... | 6.40 | 8.92 | 46.78 | 28.28 |
| Marshbrook ... | 6.20 | 4.11 | 32.72 | 29.10 |
| The Range ... | 6.34 | 7.07 | 39.13 | 29.93 |
| Vrede ... | 6.24 | 5.10 | 32.40 | 31.11 |
| Chilimanzi— | | | | |
| Beacon Hill ... | 6.27 | 4.78 | 35.56 | 31.79 |
| Central Estates ... | 7.33 | 8.11 | 45.27 | 31.83 |
| Fourie's Post ... | 4.62 | 5.14 | 35.76 | 26 81 |
| Orton's Drift ... | 4.79 | 5.80 | 36.08 | 26.13 |
| Sebakwe Post ... | 3.54 | 4.10 | 30.08 | 23.75 |
| Umvuma Railway ... | 6.18 | ... | ... | 27.54 |
| Gwelo— | | | | |
| Cross Roads ... | 6.72 | 3.73 | 34.39 | 29.22 |
| Delano Estate ... | 9.78 | 4.81 | 35.73 | n.s. |
| East Clare Ranch ... | 5.25 | 6.48 | 33.22 | 32 43 |
| Forestvale ... | 6.42 | 4.59 | 36.37 | n.s. |
| Globe and Phœnix Mine ... | 9.70 | 6.00 | 35.12 | 27.66 |
| Lannes Farm ... | 9.83 | 6.32 | 33.25 | n.s. |
| Lalapanzi ... | 6.15 | 5.82 | 33.52 | 32.55 |
| Lyndene ... | 5.66 | 7.40 | 34.25 | 27.14 |
| Woodendhove ... | 8.24 | 6.62 | 39.27 | 29.27 |
| Wold Farm ... | 6.78 | 4.93 | 36.59 | n.s. |
| Hartley— | | | | |
| Ardgowan ... | 7.94 | ... | ... | 30 67 |
| Balwearie ... | 8.52 | 6.58 | 35.03 | 32.51 |
| Battlefields ... | 5.61 | 6.28 | 38.24 | 28.44 |
| Beatrice ... | 6.04 | ... | ... | 32.82 |
| Carnock ... | 2.91 | 4.91 | 28.34 | 30.33 |
| Cromdale ... | 4.24 | 4.85 | 32.65 | 31.66 |
| Currandooley ... | 6.11 | 5.14 | 30.66 | n.s. |
| Eiffel Blue Mine ... | 6.32 | 8.10 | 30.00 | 26.55 |
| Elvington ... | 3.73 | 3.19 | 31.81 | 29.78 |
| Gatooma ... | 5.45 | 8.67 | 32.48 | 31.14 |
| Gatooma Experiment Station | 7.06 | 9.37 | 31.62 | n.s. |
| Gowerlands ... | 6.16 | 4.86 | 33.59 | 30.19 |
| Handley Cross ... | 7.25 | 6.48 | 31.34 | n.s. |
| Hartley Gaol ... | 7.10 | 8.70 | 35.73 | 31.49 |
| Hopewell ... | 6.01 | 3.91 | 28.67 | 31.44 |
| Maida Vale ... | 5 20 | 7.34 | 30.43 | 28.07 |
| Meadowlands ... | 3.92 | 4.50 | 31.02 | n.s. |
| Nyadgori .. | 5.75 | 3.73 | 25.64 | 29.50 |
| Pulham ... | 4.15 | 6.05 | 32.63 | 32.23 |
| Ranwick ... | 4.47 | 9.59 | 30.42 | 32.86 |
| Sunny Bank ... | 5.19 | 5.86 | 30.34 | n.s. |
| Thorndyke ... | 5.58 | .. | ... | 27.96 |

## RAINFALL—(*Continued*).

| STATION. | 1929. Feb. | 1929. March. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE C.—(Continued) | | | | |
| Lomagundi— | | | | |
| Argyle ... | 3.93 | 7.66 | 32 49 | 30.89 |
| Baguta ... | 2.61 | 7.70 | 32.75 | 33.09 |
| Between Rivers ... | 5.28 | 7.60 | 31.08 | n.s. |
| Citrus Estate ... | 3.02 | 6.91 | 30.45 | 30.98 |
| Dalston ... | 4.80 | 8.78 | 31.35 | n.s. |
| Strathdon ... | 3.31 | 7.50 | 27.43 | n.s. |
| Darwendale ... | 5.04 | 9.88 | 32.95 | 29.52 |
| Dedsi ... | 3.59 | 7.58 | 36.96 | 29.87 |
| Dingley Dell ... | 3.11 | 3.95 | 25.09 | 29.61 |
| Gambuli ... | 2.60 | 6.27 | 31.72 | 33.49 |
| Kapiri ... | 3.31 | 8.67 | 32.93 | 32.32 |
| Kashao ... | 5.58 | 7.25 | 30.26 | n.s. |
| Kenidia ... | 3.65 | 6.87 | 23.87 | n.s. |
| Mafoota ... | 7.80 | 9.42 | 37.81 | 29.31 |
| Maningwa ... | 2.26 | 5.82 | 30.39 | 31.42 |
| Miami ... | 4.64 | 4.87 | 30.56 | n.s. |
| Mica Field ... | 4.67 | 5 76 | 35.95 | 29.31 |
| Montrose ... | 3.57 | 8.72 | 32.51 | 31.03 |
| Mpandegutu ... | 5.49 | 7.27 | 28.53 | 31.43 |
| Msina ... | 3.23 | 4.52 | 28.36 | n.s. |
| Mukwe River Ranch ... | 5.91 | 8.05 | 38.71 | 29.36 |
| Nyapi ... | 2.55 | 6.25 | 27.78 | 30.52 |
| Nyarora ... | 3.08 | 6.82 | 28.69 | 28.71 |
| Palm Tree Farm ... | 2.16 | 11.96 | 35.47 | 29.78 |
| Pendennis ... | 3.70 | 4.55 | 29.26 | n.s. |
| Raffingora ... | 3.43 | 8.74 | 36.72 | 28.73 |
| Renardia ... | 6.47 | 10.05 | 37.47 | n.s. |
| Richmond ... | 4.10 | 4.82 | 31.30 | 26.53 |
| Robbsdale ... | 4.40 | 8.63 | 36.25 | n.s. |
| Romsey ... | 4.03 | 7.99 | 35.72 | 30.43 |
| Silater Estate ... | 4.59 | 8.57 | 34.82 | 32.70 |
| Sinoia ... | 1.92 | 7.34 | 31.59 | 30.04 |
| Sipolilo ... | 3.66 | 9.88 | 43.48 | 31.30 |
| Umvukwe Ranch ... | 9.30 | 7.99 | 31.07 | 31.48 |
| Woodleigh ... | 5.93 | 10.33 | 31.10 | 33.98 |
| Yeanling ... | 3.50 | 7.37 | 28.79 | 30.03 |
| Zebra Vlei ... | 3.26 | 10.02 | 33.40 | 28.67 |
| Marandellas— | | | | |
| Rocky Spruit ... | 6.45 | 6.40 | 50.50 | n.s. |
| Mazoe— | | | | |
| Pembi Ranch .. | 5.95 | 7.18 | 36.75 | n.s. |
| Salisbury— | | | | |
| Avondale (Broadlands) ... | 5.35 | 8.02 | 33.48 | 30.91 |
| Ballineety ... | 3.44 | 5.17 | 29.47 | 31.00 |
| Botanical Experiment Station | 4.04 | 6.30 | 31.12 | 28.37 |
| Bromley ... | 4.75 | 7.24 | 34.13 | 32.36 |
| Cleveland Dam ... | 3.80 | 7.09 | 37.19 | 30.65 |
| Forest Nursery ... | 2.57 | ... | ... | 31.47 |
| Gwebi ... | 2.79 | 5.50 | 30.60 | 31.31 |

## RAINFALL—(*Continued*).

| Station. | 1929. Feb. | 1929. March. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE C.—(Continued) | | | | |
| Salisbury (continued)— | | | | |
| Salisbury Agricultural Dept. | 3.91 | 5.99 | 30.53 | 29.99 |
| Sebastopol ... | 7.72 | ... | ... | 32.10 |
| Stapleford ... | 3.89 | ... | ... | 32.67 |
| Tobacco Experiment Station | 3.55 | 5.49 | 27.30 | n.s. |
| Western Commonage ... | 5.43 | 5.93 | 31.39 | 28.55 |
| Sebungwe— | | | | |
| Sikombela ... | 5.94 | 7.39 | 36.40 | 31.45 |
| Wolverley ... | 8.35 | 7.86 | 41.49 | 26.92 |
| ZONE D. : | | | | |
| Darwin— | | | | |
| Cullinan's Ranch ... | 2.68 | 6.37 | 29.05 | n.s. |
| M'gadzi ... | 2.42 | ... | ... | n.s. |
| Mount Darwin ... | 5.54 | ... | ... | 29.42 |
| Rusambo ... | 4.14 | 5.87 | 24.34 | n.s. |
| Inyanga— | | | | |
| Inyanga ... | 6.48 | 5.88 | 46.17 | 36.04 |
| Juliasdale ... | 8.53 | 12.15 | 52.29 | 42.51 |
| Rhodes Estate ... | 9.15 | 9.47 | 56.54 | 41.44 |
| Makoni— | | | | |
| Ardlamont ... | 3.44 | ... | ... | n.s. |
| Eagle's Nest ... | 6.97 | 5.96 | 46.71 | 31.83 |
| Mayo Ranch ... | 3.41 | 5.62 | 34.32 | n.s. |
| Wensleydale ... | 3.33 | ... | ... | 32.79 |
| Mazoe— | | | | |
| Argyle Park ... | 2.99 | 8.34 | 36.35 | n.s. |
| Atherstone ... | 2.34 | 8.66 | 32.45 | 33.97 |
| Bellevue ... | 3.38 | 9.10 | 32.88 | n.s. |
| Bindura ... | 1.82 | 6.23 | 28.18 | 31.66 |
| Ceres ... | 5.12 | 11.44 | 44.35 | 35.74 |
| Chipoli ... | 5.28 | 8.50 | 32.96 | 31.68 |
| Citrus Estate ... | 5.56 | 9.55 | 38.76 | 32.84 |
| Craigengower ... | 3.37 | 7.96 | 36.04 | 32.43 |
| Dandejena ... | 6.64 | 7.23 | 41.05 | n.s. |
| Donje ... | 5.38 | 8.06 | 40.07 | n.s. |
| Frogmore ... | 5.46 | 6.27 | 33.13 | 33.22 |
| Glen Divis ... | 2.78 | 9.07 | 36.50 | 37.80 |
| Glen Grey ... | 3.72 | 8.08 | 34.13 | 28.76 |
| Great B ... | 5.24 | 10.11 | 35.17 | 33.11 |
| Hinten ... | 3.84 | ... | ... | n.s. |
| Horta ... | 3.92 | ... | ... | 32.55 |
| Kilmer ... | 3.35 | 7.54 | 35.99 | 32.19 |
| Kingston ... | 3.85 | 7.28 | 38.04 | 36.14 |
| Maienza ... | 6.27 | 10.57 | 46.11 | 34.80 |
| Mazoe Dam ... | 4.73 | 9.17 | 31.24 | 34.23 |
| Mgutu ... | 4.52 | 7.22 | 36.33 | 37.38 |
| Muripfumba ... | 3.45 | 6.10 | 31.78 | 30.03 |
| Omeath ... | 6.58 | 7.43 | 37.64 | 31.49 |

## RAINFALL—(*Continued*).

| Station. | 1929. Feb. | 1929. March. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone D.—(Continued)** | | | | |
| **Mazoe (continued)—** | | | | |
| Pearson Settlement ... | 4.78 | 8.42 | 35.23 | 33.89 |
| Riversdale Estate ... | 5.36 | ... | ... | n.s. |
| Ruia ... | 6.64 | 8.05 | 39.61 | 34.60 |
| Rustington ... | 3.43 | 8.60 | 37.76 | 30.02 |
| Shamva Mine ... | 3.60 | 10.68 | 38.04 | 32.08 |
| Stanley Kop ... | 2.60 | 7.81 | 28.70 | 29.93 |
| Sunnyside ... | 7.18 | 8.99 | 38.30 | 32.55 |
| Teign ... | 3.96 | 7.75 | 35.60 | 32.52 |
| Usk ... | 4.25 | 9.79 | 40.57 | 38.83 |
| Virginia ... | 3.47 | 8.88 | 37.73 | 31.32 |
| Visa ... | 4.63 | 6.64 | 32.35 | n.s. |
| Woodlands ... | 5.11 | 12.52 | 43.04 | 35.58 |
| Zombi Farm ... | 4.29 | 8.66 | 38.16 | 36.47 |
| **Mrewa—** | | | | |
| Maryland ... | 3.81 | 9.46 | 35.06 | n.s. |
| Montclair ... | 4.53 | 9.83 | 39.96 | n.s. |
| Mrewa ... | 5.50 | 6.24 | 39.17 | 33.67 |
| Nyaderi Mission ... | 6 36 | 7.79 | 31.86 | n.s. |
| Selous Nek ... | 4.08 | 9.39 | 32.21 | 31.95 |
| **Mtoko—** | | | | |
| Makaha ... | 8.56 | 6.60 | 39.84 | 33.41 |
| Mtoko (N.C.) .. | 6.85 | 4.70 | 34.24 | 27.58 |
| **Salisbury—** | | | | |
| Arcturus ... | 4.63 | 9.02 | 42.40 | 38.28 |
| Chindamora Reserve ... | 4.48 | 7.18 | 31.66 | 35.40 |
| Datata ... | 4.86 | 7.55 | 41.47 | n.s. |
| Glenara ... | 6.39 | 5.86 | 33.26 | 31.99 |
| Goromonzi ... | 5.64 | 7.95 | 40.84 | 35.23 |
| Hatcliffe ... | 3.17 | 5.42 | 29.25 | 33.98 |
| Hillside (Bromley) ... | 4.02 | 5.21 | 33.76 | 36.60 |
| Kilmuir ... | 4.45 | 5.19 | 40.17 | 39.91 |
| Meadows ... | 8.21 | 8.65 | 45.79 | 38.22 |
| Pendennis ... | 4.05 | 7.10 | 34.87 | n.s. |
| Selby ... | 3.74 | 7.31 | 38.71 | 30 36 |
| Springs ... | 3.31 | ... | ... | 35.19 |
| Teviotdale ... | 4 27 | 5.82 | 32.65 | n.s. |
| Vainona .. | 4.17 | 5.30 | 34.64 | 32.03 |
| **Zone E.:** | | | | |
| **Belingwe—** | | | | |
| Belingwe (N.C.) ... | 9.37 | 7.31 | 32.21 | 21.73 |
| Doro ... | 7.90 | 4.16 | 27.47 | 23.14 |
| Shabani ... | 7.77 | ... | ... | 24.92 |
| **Bikita—** | | | | |
| Angus Ranch ... | 6.92 | 4.31 | 23.94 | 21.68 |
| Bikita ... | 8.35 | 15.73 | 41.86 | 34.35 |
| Devuli Ranch ... | 7.49 | ... | ... | 20.68 |
| Pamushana ... | 6.87 | 8.19 | 38.17 | 33.11 |

## RAINFALL—(*Continued*).

| Station. | 1929. Feb. | 1929. March. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE E.—(Continued) | | | | |
| Charter— | | | | |
| Buhera ... | 7.32 | 5.82 | 44.31 | 33.45 |
| Chibi— | | | | |
| Chibi ... | 4.01 | 5.54 | 30.08 | 22.77 |
| Lundi ... | 10.68 | 10.92 | 45.67 | 24.66 |
| Mpapas ... | 4.81 | ... | ... | 22.31 |
| Chilimanzi— | | | | |
| Allanberry ... | 6.82 | 6.07 | 36.87 | 27.97 |
| Driefontein ... | 5.73 | 10.24 | 41.62 | 26.19 |
| Felixburg ... | 5.60 | 6.16 | 35.13 | 29.16 |
| Grootfontein ... | 5.70 | 5.82 | 38.94 | 27.57 |
| Induna Farm ... | 7.82 | 7.75 | 38.62 | 31.02 |
| Mtao Forest ... | 7.78 | 5.75 | 35 49 | 28.89 |
| Mukowries ... | 5.52 | 10.80 | 50.20 | n.s. |
| Thornhill ... | 4.39 | 9.33 | 43.22 | n.s. |
| Gutu— | | | | |
| Alheit Mission ... | 7.89 | ... | ... | 24.06 |
| Eastdale Estates ... | 11.11 | 6.61 | 45.06 | 33.01 |
| Gutu (N.C.) ... | 5.73 | 11.51 | 46.88 | 28.69 |
| Glenary ... | 6.27 | 13.25 | 49.30 | 25.75 |
| Gwelo— | | | | |
| Glencraig ... | 4.67 | 8.98 | 43.57 | n.s. |
| Partridge Farm ... | 6.62 | 10.23 | 40.91 | 34.16 |
| Sheep Run Farm ... | 6.57 | 8.21 | 38.61 | 28.97 |
| Inyanga— | | | | |
| St. Trias' Hill ... | 4.70 | 11.58 | 48.07 | 37.71 |
| Insiza— | | | | |
| Roodeheuvel ... | 8.18 | 8.63 | 37.71 | 26.71 |
| Stoneham (Brac Valley) ... | 8.81 | 5.89 | 38.82 | n.s. |
| Makoni— | | | | |
| Bude ... | 8.15 | 12.41 | 45.39 | n.s. |
| Chirumwe ... | 7.25 | 8.38 | 46.95 | n.s. |
| Craigendoran ... | 10.01 | 9.79 | 41.69 | 32.73 |
| Forest Hill ... | 6.08 | ... | ... | 34.20 |
| Inyagura ... | 6.79 | ... | ... | n.s. |
| Mona ... | 5.57 | 7.65 | 49.29 | 36.71 |
| Monte Cassino ... | 6.36 | 6.00 | 41.66 | 33.17 |
| Ruati ... | 6.33 | 9.08 | 50.95 | n.s. |
| Rusape (N.C.) ... | 6.49 | 9.11 | 40.68 | n.s. |
| Springs ... | 6.34 | 5.56 | 40 39 | 32.41 |
| Whitgift ... | 7.61 | 7.68 | 46.05 | n.s. |
| Marandellas— | | | | |
| Bonongwe ... | 6.42 | 6.95 | 49.38 | 31.64 |
| Delta ... | 6.41 | 5.72 | 44.45 | 35.71 |
| Elandslaagte ... | 6.73 | 10.75 | 52.65 | 31.72 |
| Lushington ... | 5.92 | 5.99 | 40.98 | n.s. |
| Macheke ... | 6.78 | 5.95 | 45.57 | 32.43 |
| Marandellas (N.C.) ... | 4.59 | 10.01 | 42.47 | 34.54 |
| Marandellas Estate ... | 6.24 | 6.17 | 41.66 | 30.17 |

## RAINFALL—(*Continued*).

| Station. | 1929. Feb. | 1929. March. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE E.—(Continued) | | | | |
| Marandellas (Continued)— | | | | |
| Nelson ... | 6.11 | ... | ... | 29.54 |
| Wedza Reserve ... | 5.39 | 8.69 | 54.35 | n.s. |
| Wenimbi ... | 6.59 | 8.07 | 36.55 | n.s. |
| Melsetter— | | | | |
| Brackenbury ... | ... | 19.01 | 72.91 | 53.05 |
| New Year's Gift ... | 9.14 | 4.97 | 35.61 | n.s. |
| Sabi Tanganda Estate ... | 6.54 | 3.25 | 25.58 | n.s. |
| Ndanga— | | | | |
| Bangala Ranch ... | 6.74 | 5.50 | 33.19 | n.s. |
| Doornfontein ... | 6.60 | 9.19 | 39.62 | 28.81 |
| Marah Ranch ... | 8.74 | 8.26 | 44.87 | 29.54 |
| Triangle Ranch ... | 7.68 | 2.73 | 25.05 | 22.77 |
| Zaka ... | 7.93 | ... | ... | n.s. |
| Selukwe— | | | | |
| Aberfoyle Ranch ... | 9.89 | 4.93 | 41.50 | 29.87 |
| Hillingdon ... | 7.93 | 10.88 | 45.97 | 32.70 |
| Impali Source ... | 8.65 | 11.23 | 43.73 | 28.55 |
| Rio ... | 5.51 | 8.45 | 40.60 | 30.22 |
| Safago ... | 6.99 | 8.33 | 39 82 | 32.25 |
| Selukwe ... | 12.18 | 14.14 | 59.45 | 40.95 |
| Umtali— | | | | |
| Argyle ... | 8.64 | 8.92 | 42.75 | 32.15 |
| Embeza ... | 17.69 | 14.46 | 81.10 | n.s. |
| Fairview ... | 8.37 | 5.31 | 47.27 | n.s. |
| Jerain ... | 8.38 | 4.41 | 44.12 | 30.63 |
| Mutambara Mission ... | 10.97 | 4.47 | 40.03 | 27.27 |
| Odzani Power Station ... | 14.36 | 8.07 | 57.90 | 35.60 |
| Park Farm ... | 16.40 | 8.66 | 62.80 | 43.14 |
| Premier Estate ... | 8.20 | 6.42 | 47.99 | 30.29 |
| Sarum ... | 7.73 | 5.57 | 43.43 | 30.18 |
| Sheba ... | 16.69 | 19.29 | 81.61 | n.s. |
| Stapleford ... | 19.73 | 13.55 | 92.82 | 63.84 |
| St. Augustine's Mission ... | 10.75 | ... | ... | 38.91 |
| Transsau Estate ... | 7.63 | ... | ... | 30.49 |
| Umtali Gaol ... | 10.80 | 8.78 | 53.48 | 29.59 |
| Victoria— | | | | |
| Bruceliame ... | 5.12 | 11.00 | 40.32 | 26 85 |
| Cambria ... | 4.06 | 8.48 | 35.44 | 22.90 |
| Cheveden ... | 6.48 | 10.05 | 36.51 | 32.80 |
| Clipsham ... | 6.26 | 9.96 | 40.87 | 26.58 |
| Gokomere ... | 6.34 | 7.69 | 39.85 | 26.73 |
| Kimberley Ranch ... | 4.78 | 10.27 | 44.25 | n.s. |
| Mashaba ... | 5.36 | 9.91 | 42.15 | 29.34 |
| Miltonia ... | 3.81 | 8.70 | 33.91 | n.s. |
| Riverdene North ... | 3.96 | 9.39 | 37.36 | 25.35 |
| Silver Oaks ... | 5.30 | 9.71 | 38.50 | 27.58 |
| Stanmore ... | 2.86 | 6.14 | 28.15 | 24.52 |
| Victoria ... | 4.64 | 7.98 | 35.43 | 24.43 |
| Zimbabwe ... | 5.74 | 13.54 | 42.01 | 30.03 |

## RAINFALL—(*Continued*).

| STATION. | 1929. Feb. | 1929. March. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE F.: | | | | |
| Melsetter— | | | | |
| Chikore ... | 9.38 | 12.25 | 49.73 | 40.52 |
| Lettie Swan ... | 11.82 | ... | ... | n.s. |
| Melsetter ... | 14.26 | 12.02 | 62.14 | 42.26 |
| Mount Selinda ... | 20.18 | 17.34 | 72.07 | 55.05 |
| Vermont ... | 17.43 | 17.57 | 76.16 | 55.76 |
| Umtali— | | | | |
| Cloudlands ... | 18.44 | 14.78 | 83.77 | n.s. |

# Export of Cattle from Southern Rhodesia, 1929.

| Month | Union | | England. | Congo | | N. Rhodesia | Portuguese East Africa. | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Slaughter | | Slaughter | | | | | | | |
| | Johannesburg | I.C.S. for overseas | On hoof | Slaughter | Breeding | Breeding | Slaughter | Trek | Breeding | |
| January ... | 66 | ... | ... | 2,222 | 272 | 12 | ... | ... | ... | 2,572 |
| February ... | 84 | ... | ... | 656 | ... | ... | 12 | ... | ... | 752 |
| March ... | 12 | 1,353 | ... | 1,845 | 1,803 | 19 | 24 | ... | ... | 5,056 |
| April ... | | | | | | | | | | |
| May ... | | | | | | | | | | |
| June ... | | | | | | | | | | |
| July ... | | | | | | | | | | |
| August ... | | | | | | | | | | |
| September ... | | | | | | | | | | |
| October ... | | | | | | | | | | |
| November ... | | | | | | | | | | |
| December ... | | | | | | | | | | |

J. M. SINCLAIR,
Chief Veterinary Surgeon.

## Dates of Meetings of Farmers' Associations, Southern Rhodesia.

| Name of Association. | Place of Meeting. | Secretary. | May. | June. |
|---|---|---|---|---|
| | | | 1929 | 1929 |
| Ayrshire—Sipolilo | Various farms | G. H. Cautherley | 11 | 8 |
| Banket Junction | Banket Hotel | A. M. Hutchinson | 3 | 7 |
| Beatrice District | Farmers' Hall, Beatrice | W. Krienke | 30 | 27 |
| Bindura | Bindura Farmers' Hall | W. E. Fricker | 10 | 14 |
| Bromley | Farmers' Hall, Bromley Siding | W. D. Grier | 1 | 5 |
| Bubi | Queen's Mine | C. H. Olsen | 14 | 11 |
| Bulawayo Landowners' and Farmers' Association | Library Buildings, Bulawayo | W. A. Carnegie | 9 | 13 |
| Chakari | Newbiggin (May), Dodington (June) | L. T. Tracey | 15 | 19 |
| Daisyfield | Somabula (May), Daisyfield (June) | L. E. Edwards | 11 | 15 |
| Darwendale—Trelawney | Various farms | Charles H. Tanner | 22 | 26 |
| Eastern Districts | Farmers' Hall, Chidza | W. E. Richards | 11 | 8 |
| Enkeldoorn | Enkeldoorn | C. N. Ludlowe | 7 | 4 |
| Enterprise | Farmers' Hall | James Watson | 7 | 4 |
| Essexvale | Essexvale | Col. D. Judson | 19 | 16 |
| Felixburg—Gutu | Gongwe (May), Trafalgar (June) | A. J. Bradshaw | 11 | 8 |
| Figtree Branch, R.L. and F.A. | Figtree Hotel | The Secretary | 7 | 4 |
| Gadzema | Gadzema | M. G. Leahy | 10 | 14 |
| Gatooma | Speck's Hotel | B. L. Henderson | 18 | 15 |
| Gatooma (Golden Valley Branch) | Golden Valley Hotel | C. K. James | 11 | 8 |
| Gazaland (South Melsetter) | Chipinga Hotel | Mrs. C. N. Reading | 6 | 3 |
| Greystone | Quarrie Farm | P. J. van der Walt | 11 | ... |
| Gwanda | Lowenthal's Building, Gwanda | N. J. B. Nilson | 18 | 15 |
| Hartley | Old Schoolroom, Hartley | Mrs. F. C. Watson | 25 | 22 |
| Headlands | Headlands | J. A. Eve | ... | ... |
| Hunter's Road | Hunter's Road | R. W. Twilley | 25 | 29 |
| Insiza South | Farm Lancaster | J. Campbell | ... | ... |
| Inyazura | Inyazura | W. P. Frudd | ... | 7 |
| Lalapansi | Lalapansi | B. J. Ingle | 11 | 8 |
| Lomagundi | Sinoia | F. W. Robertson | ... | ... |
| Lomagundi West | Various farms | A. A. Bisset | 12 | 9 |
| Macheke | Farmers' Hall, Macheke | Major Hastings | ... | ... |

| | | | | |
|---|---|---|---|---|
| Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association | Various Farms | T. R. Colam | 4 | 1 |
| Makwiro | Makwiro | W. L. Parsons | 17 | 21 |
| Marandellas | Marandellas Farmers' Hall | E. Cruikshank | 3 | 7 |
| Marandellas, Southern | Various farms | B. V. Cherry | 1 | 5 |
| Mashonaland | Mashonaland Farmers' Hall, Salisbury | C. Lamb | 10 | 14 |
| Matobo South | Farmers' Hall, Malundi Farm | A. G. Allan | 18 | 15 |
| Matopo Branch, R.L. and F.A. | Farmers' Hall, Malundi | W. Mirtle | 18 | 15 |
| Mazoe (Concession) | Concession Hotel | A. W. Laurie | 10 | 14 |
| Mazoe (Glendale) | Farmers' Hall, Glendale | James S. Brown | 8 | 12 |
| Melsetter | Court House, Melsetter | J. C. Kruger | 9 | 13 |
| Midlands Farmers and Stockowners | Royal Hotel, Gwelo | T. R. van Rooyen | 8 | 12 |
| Ngezi-Umniati | Harvieston, Enkeldoorn | Miss Harvie | 25 | 29 |
| North Umniati | ——— | J. F. Eagar | Not | received |
| Norton and Lydiate District | Norton | R. D. Palmer | 3 | 7 |
| Nyamandhlovu | Nyamandhlovu | R. D. McLean | ... | ... |
| Odzi District Farmers | Odzi Hotel | F. H. Burnett | 4 | 1 |
| Poorte Valley | Various places | A. D. Wilson | 18 | 15 |
| Que Que | Offices of the Que Que Sanitary Board | A. A. Ackerman | 18 | 15 |
| Rusape Farmers' Association | Rusape | R. Munch | 4 | 1 |
| Salisbury South | Various farms | P. Linton | 29 | 26 |
| Selukwe | The Hotel, Selukwe | W. T. Simpson | ... | ... |
| Shamva | Shamva Court House | W. Stanley-Stollard | 17 | 21 |
| Two Rivers Farming Association | Various farms | W. L. Parsons | 18 | 15 |
| Umboe (Branch of Lomagundi F.A.) | Various farms | C. W. S. Ford | 11 | 8 |
| Umvukwe Farmers' and Tobacco Growers' Association | Various ranches | Com. E. Wrightson | 11 | 8 |
| Umtali | Drill Hall, Umtali | A. Howat | 2 | 6 |
| Umvuma and District | Umvuma | S. T. Montgomery | Not | received |
| Victoria | Victoria | G. E. Lamb | 4 | 1 |
| Wankie District | ——— | F. H. Going | Not | received |
| West Umvukwe Farmers' Association | Various farms | G. H. Gordon | 4 | 1 |
| Western | Plumtree Hotel | The Secretary | 4 | 8 |
| Willoughbys | Willoughbys | A. E. Roberts | Not | received |

# Farming Calendar.

## May.

### BEE-KEEPING.

Last month under normal conditions should have seen the last honey flow of the season almost ready for robbing, for which purpose have the extractor overhauled, spare crates available, bee escape boards ready, honey jars and bottles ready for usage, and also have a few spare quilts on hand. Do not rob the bees of too much honey, remembering that sending them into winter quarters with a sufficiency of food means a strong issuing colony in the spring. Any new swarms that it may be decided to add to the apiary, feed well if necessary, to induce stimulative breeding while there is time, or if new young queens have replaced older ones also feed liberally this month in the proportion of one part of cane sugar to two of water; for the somewhat wild Rhodesian bee there is nothing like the Alexander feeder let in from the back. Keep all the spaces under hive stands clean, also inspect daily to see that white ants are not building up from the soil; if this is neglected much loss may follow. When seen, sprinkle diluted kerol from a watering can under the hive stand.

### CITRUS FRUITS.

The harvesting of the early ripening fruit should be commenced about the first week in May. Exporters should cure their Washington Navels for a longer period than usual; this will enable them to detect the thick skinned fruit easily.

Where necessary, irrigation should be continued up to within ten days of harvesting.

All ploughing and cultivation should be completed without delay.

### CROPS.

Continue to cut and stook maize as it matures; make the stooks small to assist drying. Later in the season the stooks may be made larger. See that the stooks are secure and pick up plants lying on the ground. Continne to plough up land between stooks of maize. Give all maize harvested, whether husked or in the husk, a chance to dry out before riding to the dumps. Do not begin shelling if the ears are still damp. Do not use new grain bags for harvesting maize. Make the dumps of unhusked ears as small as possible; the smaller the dump the quicker the grain will dry out. Grain on the cobs dries extremely slowly, if at all, in dumps of large size. Do not mix unhusked ears from the stooks with dryer ears harvested later from the standing crop. Keep the dryer ears in a separate dump; shell, bag and stack such maize separately. When cutting maize for stooking, insist on the stalks being cut within 2 to 4 inches of ground level. The plough, in Rhodesia, will not bury roots with stalks 8 to 12 inches high. A long stubble of stalks makes clearing of the ground for ploughing very tedious and expensive. If not already harvested, ground nuts should be lifted before the first frosts damage the hay. Finish transplanting onions from seed-beds. If plants are not flourishing after transplanting, give a light dressing of nitrate of soda—50 lbs. per acre. Repeat in a fortnight if needed. Sow most winter cereals on wet vleis or under irrigation early

this month. Feed your sweet potato vines to stock; if frosts occur the vines will be killed. Dig and feed tubers from end of month onwards. Towards end of month harvest cattle pumpkins and melons and handle carefully; avoid bruising to prevent rotting. Place pumpkins and melons in a dry situation in the open and in a single layer. Supply plenty of roughage to cattle pens, kraals and stables to increase the manure supply. Collect and cart manure to lands for spreading. Do not attempt to plough in dry grass or quantities of maize refuse. The plough will not turn it under and it will not rot before next planting season. Burn such refuse and make a good job of the ploughing. If the weather seems set fair, commence brick-making. A small kiln of bricks always on hand is most useful. As labour permits, re-thatch buildings and outhouses in need of repair. Overhaul, grease and paint planters, drills and other implements not required again until next season, and store away under cover. Think about your fertiliser requirements for next season and place your orders. From now onwards the second ploughing of new land broken up earlier in the season should be pushed on with as opportunity offers.

## DECIDUOUS FRUITS.

The pruning of early ripening peaches should be performed this month.

All holes should be completed and kept in readiness for June planting.

Ploughing or digging and cultivation should be completed without delay.

## ENTOMOLOGICAL.

Cabbage Family.—Plants of this family are liable to suffer greatly from cabbage louse and Bagrada bug during May. For the former, spray with soap and tobacco wash, which may help if the plants are not too big.

Dhal.—Blister beetles are still injurious to the blossom of the crop, and should be regularly collected and destroyed.

Citrus Trees.—Continue to collect and destroy all fruits infested with citrus codling.

Guava.—Fruit fly and citrus codling breed in these fruits during the autumn and winter.

Tobacco.—Watch should be kept for emergence of the adult wireworm beetle. These should be poisoned with Paris green in the proportion of 1 lb. to 200 lbs. of maize meal. The bait should be spread on the land in small heaps early in the morning, and shaded from the sun.

## FLOWER GARDEN.

The month of May is a suitable one for the preparation of new flower beds. The ground should be well trenched, and if of poor quality, a light dressing of well-rotted manure will be a distinct advantage. Too heavy dressing is not advised, as too rich a soil is likely to produce an abundance of foliage and very few flowers. It is not too late to sow sweet pea seeds, but the best results come from early planting. By this time all bulbs for spring flowering will be planted. Chrysanthemums, delphiniums, dahlias and other herbaceous perennials may now be cut down, and if necessary taken up, divided and replanted

## VEGETABLE GARDEN.

It will be necessary during the early part of the month to clear off what remains of summer crops, such as haricot beans, peas, cucumbers, etc. Where winter deep rooting vegetables are to be grown, such as carrots, parsnips and beets, the soil and sub-soil should be deeply worked, so as to allow a ready root run for these vegetables. A dressing of lime will be of great value in every section of the kitchen garden. This will especially help to minimise future attacks of insects and fungus attacks. New asparagus beds may be made this month; old beds should be cut down, cleaned and kept in good order; also a light dressing of stable manure may be given to the beds. Planting may be made of all seedlings,

such as cabbage, cauliflower, lettuce, onions, etc., and seeds of carrot, leek, lettuce, onions, peas, radish, turnip, parsnip, broad beans may be sown.

## FORESTRY.

Continue pricking out seedlings into tins. Deciduous trees which are propagated by means of cuttings should be taken in hand.

See that the fire lines are in order, and in the case of woods which have formed canopy, remove inflammable material below the edge trees.

Place orders for any trees proposed to be planted during the ensuing season, so that nurserymen may make provision.

## POULTRY.

All cockerel chickens should be separated from the pullets, and every month be gone over carefully, the poorer ones eliminated and only the very best kept. Those cockerels with the deep long bodies, short legs and round heads should be kept. Those with any inclination to long legs, knock knees, long heads or thin beak, lop-over combs, narrow bodies, or those lacking length and depth should be rigorously discarded. The chickens must not be allowed to become chilled, especially at night; on the other hand, they must not sleep in a hot stuffy atmosphere. On no account must they be overcrowded; this is fatal and is one of the many rocks on which poultry keepers come to grief.

The young stock must have all they can eat; to stint them is to ruin them for good and all. A bird that has been stunted never recovers. Remember that they require food for heat, energy, repair of wear and tear, and to produce bone, fat, flesh, tissue, blood and feathers. A good quality bone meal (lime phosphate) is absolutely necessary, as is also plenty of succulent green food, and no animal protein is better than thick separated milk for the health and growth of the chickens.

Those going in for ducks should hatch according to the numbers they have to supply for eating each week. Ducks must have all the food they will eat from the time they are hatched. A quick-growing duck should put on 1 lb. per week and be ready for killing at from seven to eight weeks old. Always kill or sell for killing just before the large wing feathers commence to grow.

If the rains have stopped, turkeys can be hatched. See that the youngsters are kept warm, but also that they have plenty of fresh air. Never feed young turkeys on wet or moist food, but give dry mash, grain, plenty of onion tops or onions chopped small, and thick separated milk. Keep them free from insect vermin; they will never thrive if they are infested with these.

Never allow the hen that has hatched the turkey eggs to run with the youngsters. Always confine her in a coop, through the slats of which the young turkeys can run in and out. The coop should be moved to fresh ground each day; nothing is worse for young turkeys than to be running on the same piece of ground for long at a time. Tainted ground is one of the chief causes of mortality among young turkeys.

## STOCK.

Cattle.—Ranching cattle may still be expected to be in good condition. In most districts it will be wise to conserve hay, maize stover, ensilage and a supply of any other cheap feed as a provision against possible late rains in the spring, and to enable one to maintain the younger or very old stock should occasion arise. By the middle of this month dairy cattle will require more serious attention in the matter of feed. Grass should be cut for bedding and both cows and calves should be well bedded down at night from now onwards, and cowsheds should be put in good repair. Attention should be given to the water supplies and care taken that they are clean and sufficient.

Sheep.—If the vleis have dried, sheep may be allowed into the lower lying veld. If the rams are put in now, lambs will arrive in October, which is usually a good month to arrange for. Those who favour winter lambs and have ewes lambing now will find a few handfuls of maize, together with chopped maize stalks or any other kind of available roughage or green stuff, a great help to the ewes in providing milk.

### TOBACCO.

Curing should be completed as early in the month as possible to prevent loss from frost. The bales of tobacco should be examined and turned weekly until they are despatched from the farm.

All bulks must be inspected regularly and turned if necessary. Tobacco seed should be shelled as soon as the seed pods are dry and the seed carefully labelled and stored in a dry place.

The stumping, clearing and ploughing of new land, if operations have not already been commenced, should be no longer delayed. Land which has just produced a crop should be ploughed and harrowed as soon after the harvest as possible.

### VETERINARY.

Horse-sickness will still be in evidence, and may be expected to continue until the frosts occur. Inoculation for blue tongue should be performed in the dry season only, unless the animals can be kept under cover for 21 days. Do not inoculate ewes in lamb on account of abortion. Inoculated animals spread the disease for 21 days. Scab is a poverty winter disease.

### WEATHER.

During the major portion of this month the ordinary winter conditions prevail, viz., cloudless sunny days and cold nights. Frost may be normally expected at any time during the latter half of the month. There is often, however, a recrudescence of rain conditions during the early portion of the month, resulting in overcast days and light drizzling showers, the normal rainfall at many places, particularly in the southern and eastern portions of the country, amounting to over half an inch.

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# June

### BEE-KEEPING.

At this season hives require to be painted; the woodwork, being exceedingly dry, is in good condition to receive it. Linseed oil (unboiled) is the best kind to mix with white lead, as it is more penetrating, acting as a better preservative than boiled oil. Bees will be able to take beneficial flights during warm days, so that dysentery need not be anticipated.

### CITRUS FRUITS.

Cultivation of the grove is to be continued. Early ripening fruit must be harvested and marketed without delay. Mid-season varieties will be fit for packing early in the month. These should be shipped as early as possible, so as to extend the late variety export season as much as possible. Most late ripening varieties will require irrigating during the month.

A small amount of pruning should be done. If fumigation is to take place, remove the small branches that touch the ground, cut out all dead wood and water shoots.

## COTTON.

In cleaning up the cotton fields care will have to be exercised in the supervision of the pickers. The cotton harvested at this period of the season generally comes from late bolls naturally matured and those prematurely opened by the cold weather and frost. The matured seed cotton should be kept entirely separate from the immature seed cotton. There will also be some dirty and stained cotton in this final picking. Arrangements for next season's seed requirements should receive consideration.

## CROPS.

Select seed from the very best of your own crops. It is always wise to keep more seed than you may need for planting. Do not shell and ride your maize to the railway unless it is fit for export or market. If in doubt regarding the moisture content of the maize, send a 2 lb. sample in an air-tight tin, such as a golden syrup tin, to the Agricultural Department and have it tested. Provide ample dunnage for your maize stacked at the railway or on the farm. Use maize cobs; husks are almost useless for this purpose. Sew your bags of maize according to the export regulations and stack them properly at the railway side, leaving plenty of room between the double rows. Select pumpkin and melon seed from the best specimens. Support your agricultural show and make it a success by preparing and entering as many exhibits as you can. No one is more to blame for a poor show than the farmers themselves. Make a list of the seed requirements for next season, and where purchases must be made, place the orders early.

Veld fires must be anticipated, and if not already attended to, the mowing or burning of fire-guards, both boundary and internal, should be proceeded with.

## DAIRYING.

At this time of the year the farmer should experience very little difficulty in producing cream of first-grade quality. During the winter months the separator should be adjusted so as to deliver cream testing 40 to 45 per cent. butter fat.

On exceptionally cold days care should be taken that the milk is not allowed to become too cold before separation—for efficient skimming, the milk should be separated immediately after milking and at a temperature not lower than 90 degrees F.

Farmers engaged in butter-making are usually successful in obtaining a good grain and firm body in butter at this season of the year. During cold weather it is frequently necessary to warm the cream for churning. The most satisfactory method of warming the cream to the proper churning temperature is to place the bucket or receptacle containing the cream in a tub or bath of water at a temperature of about 95 degrees F., stir the cream frequently and replace the water when cold.

Under the cool conditions which obtain from this time of the year onwards, cheese-making operations are usually most successful.

Care should always be exercised, however, in using evening's milk. If the milk is over-acid it should not be used, or a hard, dry cheese will result. Morning's milk plus a starter usually gives the best quality of cheese. The starter should have a clean sour taste and smell. In early winter, milk for cheese-making frequently contains a high percentage of fat, and in order to firm the curd properly in the whey it is usually necessary to raise the scalding temperature a few degrees.

At this period of the year winter feeding of dairy stock should commence in real earnest. The milking cows should now be in fairly good condition, and in order to maintain a full flow of milk throughout the cold, dry months of winter, it is essential that liberal feeding be practised. As far as possible an attempt should be made to imitate summer conditions by feeding an abundance of succulent and palatable food. Maize silage,

sweet potatoes, pumpkins, etc., are very useful for this purpose, but these feeds should be supplemented by dry roughage of good quality, preferably a legume hay, and a liberal allowance of mixed concentrates.

For dairy heifers, weaned calves, etc., there is possibly no better ration than one consisting of maize silage, legume hay and mixed concentrates, and these feeds, if supplied in liberal quantities, should serve to keep the young stock in a thrifty, growing condition.

## DECIDUOUS FRUITS.

General pruning may be done this month if the leaves have fallen. This should be confined, as far as possible, to the thinning out of diseased, weak, broken and dead shoots.

Tall trees may be reduced in height, and old and unprofitable trees headed back to induce the growth of new fruiting wood.

Trees that shed their leaves late may be pruned in July. The necessary preparations for planting trees should be completed during the month and planting commenced towards the end of the month.

Cultivation should be continued.

## ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during June.

Onions.—Suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

## FLOWER GARDEN.

Annuals for early spring flowering should be sown, preferably in paraffin tins cut lengthwise, in a place sheltered from the wind. Perennials, shrubs and ornamental tree seeds may also be sown. Fruit trees, shrubs and roses should be pruned and all dead wood removed. Sweet peas require constant attention.

## VEGETABLE GARDEN.

All the available space in the garden should now be thoroughly trenched and manured, the soil being well worked and loosened. Vegetables planted out for winter crops should be well and continuously cultivated, which will help to bring them along quicker and with less watering. Late-bearing tomatoes should be sheltered from the cold winds by a grass shield. Beet, radish, carrot, parsnip, turnip, onion, leek, mustard, cress and tomatoes may be planted.

## FORESTRY.

Care should be taken by further ploughing of land or burning of grass that all fireguards round plantations are in good order and effective. Thinnings where necessary may be continued, and fellings which are to be made are to be carried out. Cuttings may be taken and struck now of deciduous trees, such as the Carolina poplar. The pricking out of conifer seedlings into tins should be continued, and sowing of such seed for the coming planting season may be completed. A commencement may be made of preparation of land to be planted during the ensuing season, e.g., by stumping if necessary, and ploughing where practicable.

## GENERAL.

Grazing is deteriorating, and the next few months may be a period of difficulty for the rancher. It is a mistake, frequently seen, for all the grazing nearest to the drinking places to be first consumed, so that later on the cattle, when least able to endure fatigue and when the grass

is in any case most scanty and dry, have furthest to walk from the feeding ground to water. A little forethought can obviate this trouble. Live stock are usually in good condition at this time of year and able to travel longer distances to water than may be the case later on in the season. Fire guards to prevent grass fires should be looked to.

## POULTRY.

The poultry keeper must be on the look-out for sudden cold snaps, for if some precautions are not taken, the production of eggs will drop. This was very noticeable at the end of last March and the beginning of April. Iron houses without a good thick layer of grass on the top and round the sides will be very cold at night for the birds, and not only will the egg output drop, but the birds will very likely contract congestion of the lungs, bronchitis or pneumonia.

Cold weather, too, is likely to affect the breeding stock and cause infertile eggs. A little extra crushed mealies added to the evening feed on cold days, or a little barley softened with hot water, will keep up the body heat of the birds.

This is one of the poultry keeper's busiest periods, but method, cleanliness and attention to details pay him well. Do not leave anything that you can spare the time to do yourself to natives. Watch carefully your breeding birds, and on the slightest sign of one going off, take him or her away; if left, you will have infertile eggs, weak germs, weak chicks difficult to rear, and later weak and unprofitable stock. See that the male bird has all the food he requires, and give him a meal by himself twice a week, also a small piece of raw meat three times a week. Those who are using incubators should watch the temperature of the room on cold nights, for variations in temperature result in delayed and poor hatches, and often deformed chicks.

## STOCK.

Cattle.—Where it is necessary to move cattle to fresh pasturage, this should not be unduly delayed. Cows with autumn calves should be kept in the more sheltered paddocks. A watchful eye should be kept on all watering places in order to prevent their being fouled or stopped up. Bulls should be kept out of the herd until the end of July at least, and, in the meantime, they should be well fed and cared for in order to fit them for their work. The three watchwords in the dairy herd should be feed, shelter and bedding from now onwards. Ensilage will now be found invaluable, as also will pumpkins, majordas or any other form of succulent food. Good hay should be used to rack up with at night, and the maize ration should be supplemented with ground nuts, ground nut cake or bean meal. Young calves are better in the pens on very cold mornings until the sun has gained some power, when they may run on short sweet veld for a few hours. The above remarks with regard to dipping and water supply apply equally to dairy as to ranching herds.

Sheep.—Sheep are best kept on the high veld for a while longer. If grass seeds are troublesome, a grazing area should be mown. If the rams were put into the flock in May, they should now be removed. Ewes with lambs will benefit by a few handfuls of mealies, and perhaps ensilage. They should be provided with shelter from cold winds.

## TOBACCO.

The grading of tobacco should be proceeded with. Any bales stored on the farm should be turned occasionally, especially where more than one bale is placed on another. Arrangements for the grading of tobacco seed should be made for the coming season. Growers purchasing tobacco seed should place orders early with distributors of reliable seed.

## VETERINARY.

Horse-sickness should be practically over now. Redwater and gall-sickness occur all the year round, but the worst time is the summer, when

ticks are prevalent. Blue tongue should be very little in evidence now. Inoculation can be carried out now. Scab is a poverty winter disease.

WEATHER.

Casual rains may occur, but except on the eastern frontier, none is to be reckoned upon,- nor can it be regarded as seasonable or desirable. Frosts generally occur on a few nights during the month of June, and precautions must therefore be taken. This month and the next are the coldest of the year, and when the cold is accompanied by dull weather or "Scotch mist," known locally as "guti," it is apt to have a severe effect on live stock, especially if grazing should at the same time be scarce and water supplies far to travel to.



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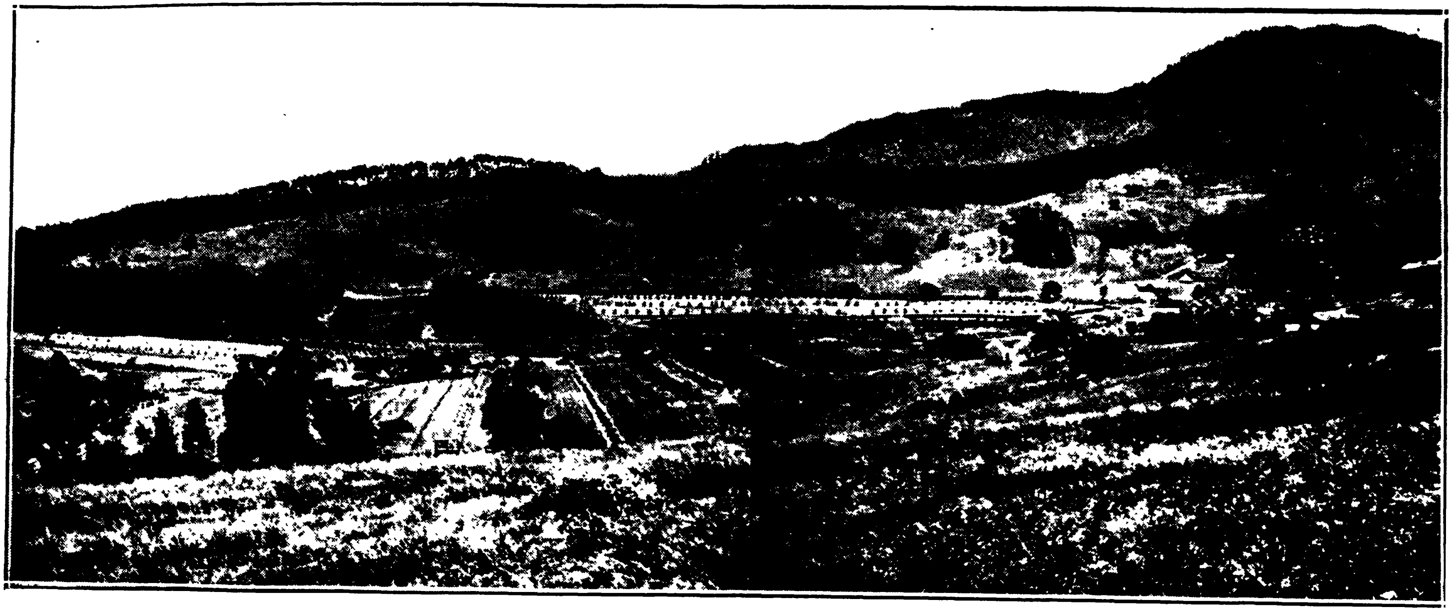

Mrs. A. Strickland's farm Inodzi, Umtali district. The crops stooked are maize. In the front the land between the stooks has been ploughed and oats and wheat planted. The irrigation channels can be seen between the stook lines.

THE RHODESIA

# Agricultural Journal.

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## Editorial.

*Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.*

**History Repeats Itself.**—We are indebted to Mr. F. M. C. Stokes, of the High Commissioner's Office, London, for the following:—

"As all Rhodesians are directly or indirectly concerned with tobacco, the following extract from Dr. W. Robertson's 'The History of America,' Vol. IV., Eleventh Edition (containing the History of Virginia to the year 1688), may not be without interest to your readers. The book was published in 1808, and the events described took place more than three centuries ago."

'The induftrious fpirit which began to rife among the planters was foon directed towards a new object, and they applied to it for fome time with fuch inconfiderate ardour as was productive of fatal confequences. The culture of

tobacco, which has fince become the ftaple of Virginia, and the fource of its profperity, was introduced about this time into the Colony. As the tafte for that weed continued to increafe in England, notwithftanding the zealous declamations of James againft it, the tobacco imported from Virginia came to a ready market; and though it was fo much inferior in quality or in eftimation to that raifed by the Spaniards in the Weft Indian iflands, that a pound of the latter fold for eighteen fhillings, and of the former for no more than three fhillings, it yielded a confiderable profit. Allured by the profpect of fuch a certain and quick return, every other fpecies of induftry was neglected. The land which ought to have been referved for raifing provifions, and even the ftreets of James-Town, were planted with tobacco. Various regulations were framed to reftrain this ill-directed activity. But, from eagernefs for prefent gain, the planters difregarded every admonition. The means of fubfiftence became fo fcanty, as forced them to renew their demands upon the Indians, who, feeing no end of thofe exactions, their antipathy to the Englifh name revived with additional rancour, and they began to form fchemes of vengeance, with a fecrecy and filence peculiar to Americans.'

**Good Farming.**—We commend the following extract from the annual report for 1928 of the Chief Agriculturist to the careful attention of farmers:—

"Farmers have admittedly had much to contend against, and sympathy is undoubtedly due to them; but the solution of many of their difficulties lies in their own hands. Taken as a whole, they have not yet got down to solid, serious farming. Many non-successes are unquestionably due to lack of system—to farming without a definite purpose—and to dropping one line of activity before it has been fully studied in order to snatch at something newer and apparently more attractive. Inconsistencies of this kind lead nowhere, and instances are numerous where, after years spent on the same farm, the owner is no nearer to a settled policy and a solid basis to his business than when he started. There are also many cases where second best methods are thought to be good enough, but in farming there is no

greater fallacy than this. The only man who will succeed on the land is the one with a clearly thought out and settled policy, who knows what he wants to do, and how and why to do it, and above all who brings to every operation of the farm, be it in respect of stock or crops, a maximum standard of efficiency. To-day these conditions are far from being realised. Some farms are over-stocked. Very few farmers grow sufficient of the most suitable food crops for the requirements of their live stock. Winter ploughing is widely neglected, poor ploughing is of common occurrence, planting is often delayed unduly late, and weeds are not adequately controlled. More extensive rotation of crops could be adopted if more attention were paid to growing food for live stock and to fattening beef cattle. These are only a few of the directions in which the farmer, aided by the Department of Agriculture, can and must help himself if he is to make a success of his business."

No words of ours are necessary to emphasise the significance of these remarks. The Chief Agriculturist has been associated in an official capacity with the farming industry of this Colony for the past twenty years, and no one is better able than he to express an opinion on the methods employed by farmers. There are outstanding successes in farming in this Colony, and, alas! there are and have been many failures. Success has only been achieved by the application of approved methods, by careful study of the particular kind of farming followed and by constant personal supervision and attention to detail. There have been no lucky shots. We trust that the extract we publish will be widely read and taken to heart, for we are convinced there are very few farmers who could not improve their methods and their profits by following the above advice.

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**Retiral of Mr. Little.**—Poultry keepers throughout the Colony will regret exceedingly that Mr. Little, Chief Poultry Expert, retired from the Service at the end of May, having reached the age limit. Mr. Little took up his present appointment in August, 1918, having previously been engaged in poultry farming on his own account on a considerable scale in the Union of South Africa, prior to which

he held the appointment of Demonstrator and Lecturer in Poultry at the Middelburg School of Agriculture. When Mr. Little came to Rhodesia, poultry keeping as an industry was non-existent. The comparatively few birds that were kept were mostly of a nondescript cross-bred type, and methods of housing and feeding were generally very crude. Mr. Little changed this state of affairs. He toured the Colony from end to end, and his enthusiasm and knowledge of his subject were soon reflected in the improved type of bird seen on farms and at the agricultural shows. The year after Mr. Little came here he instituted the egg-laying tests, which have been maintained every year since and have been responsible for a pronounced improvement in the production per bird and the quality of eggs laid. He also founded the Egg Circle, which has depots at each of the principal centres of the Colony and is the outward and visible sign of co-operative effort amongst poultry keepers. In collaboration with his assistant, Mr. Wheeldon, who joined him as the work grew, Mr. Little established the poultry register of pedigree birds, particulars of which were given in the *Rhodesia Agricultural Journal* of January, 1929. Mr. Little has never spared himself; in fact, he has always been one of the hardest worked officials of the Department of Agriculture. His heart was in his work, and he has the satisfaction of knowing that his labours have not been in vain. The poultry industry of Southern Rhodesia is still in the making, but it has been established on solid foundations, and if the advice which has so freely been tendered during Mr. Little's term of office is only followed there is no reason why, with the opening up of big markets in the north, the industry should not assume very great importance.

Mr. Little is not seeking a life of idleness, but has acquired a small holding at a sequestered spot on the beautiful south coast of Natal, where he will establish a stud pedigree poultry farm. Poultry keepers and his colleagues in the Department of Agriculture, with whom he was very popular, will wish him success in his new venture and many years in which he and Mrs. Little may enjoy the change from arduous active service.

**Wheat Variety Trials.**—In the May issue of the Journal we indicated that some particulars would be given in the present issue as to the behaviour of some of the varieties of wheat under trial at the Agricultural Experiment Station, Salisbury, this season. **Kenya Governor** and **Droop 3,** which were originally obtained from the Department of Agriculture, Kenya, in 1926, were definitely the most rust-free. They did not show any signs of rust at any stage of their growth until three days before reaping, when those tillers which bore small green ears began to show signs of rust; the tillers that ripened had no rust attack whatsoever. **Droop 3** has a very weak straw. **Pusa 52A** was next in order of resistance to rust. This wheat, however, had many defects, such as low yield, numerous unripened tillers and shortness of straw, etc., but it may prove to be useful for crossing purposes. **Quality,** until a week before reaping, did not show any signs of rust, but the disease then appeared on a fairly large number of plants. Rust in this instance, however, appeared so late that it did not affect the ripening of the grain in the least. **Cawnpore 13** was badly rusted at an early stage, and this was reflected to a marked extent in the poor quality of the grain and the weakness of the straw. **Reward Ottawa,** brought from Canada by the Honourable Lionel Cripps, of Umtali, at first showed great promise, but later developed rust. This variety has an excellent straw, the grain is well filled and it does not appear to have deteriorated in any way. This is its first season under trial in this Colony, and from the single plant selections made it is hoped that a strain will be isolated which will resist the ravages of rust. The two wheats brought from England by Mr. Sansom did not have a fair chance, as they were sown in a very bad patch of ground. They will be given a further trial next season. The majority of the remaining forty-five varieties under trial were all badly rusted or were too late in maturing to be of any value. Mention should be made of some selections made by the manager of the station, Mr. Arnold. These varieties are late in maturing and the grain is not suitable for milling for bread purposes, but they are extremely drought-resistant, have a good strong straw and appear to be markedly resistant to rust. The last named qualities should be of great value in using these selections for crossing purposes.

Single plant selections have been made from all the most promising varieties, and these will be planted next season. It is hoped that they will produce a more uniform type of wheat, for the varieties under trial are very mixed. The soil on the plots where the trials are in progress is a red loam, and the rainfall recorded during the season was 31.69 ins., distributed as follows:—November, 3.88 ins.; December, 5.45 ins.; January, 11.52 ins.; February, 4.40 ins.; March, 6.30 ins.; April, 0.14 in. Planting took place on the 11th January and reaping was commenced on the 20th April and finished on the 4th May.

It is, of course, obvious that conclusions cannot be drawn from the work of one year, for wheats which were immune to rust this season might conceivably be attacked in another season of different climatic conditions. A good beginning has, however, been made and knowledge gained which it is hoped will bring nearer the day when wheat will be added to our list of summer crops.

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**Agricultural Legislation.**—We publish below summaries of various measures of interest to farmers, passed by the Legislature during the present session. We have only given a broad outline of the principal features of these measures, and readers who desire fuller information are advised to obtain copies of the Bills as finally adopted from the Controller of Printing and Stationery, Salisbury.

**"Animals Diseases Consolidation Ordinance Amendment Act, 1929."**—This Act provides for the reporting of all deaths of cattle, whether owned by Europeans or natives, the object being to enable the Veterinary Department to cope more effectively with outbreaks of disease such as African Coast Fever. Although the provisions of the Act can be applied throughout the Colony, the Minister of Agriculture and Lands, in his speech in the House on the Act, indicated that these provisions would only be applied where it was deemed necessary. Regulations as to procedure will be published in due course.

**Stock and Produce Theft Repression Bill.**—This Bill requires every butcher and buyer of skins and hides to keep a register for the purpose of recording the number of skins and hides bought or otherwise obtained from Europeans, natives and any other persons, and such particulars as may be prescribed by the Governor-in-Council, including the names and addresses of the persons concerned. Monthly extracts from this register have to be submitted to the nearest Magistrate, Native Department official or police officer in a form to be prescribed by the Governor-in-Council.

The object of the Bill is to minimise the risk of stock theft, and as such it should be welcomed by all farmers.

**"Tsetse Fly Act, 1929."**—This Act empowers His Excellency the Governor to declare, by Proclamation, any defined area in Southern Rhodesia to be a tsetse fly area, and to make regulations for the following purposes:—

(a) prohibiting the movement of persons, domestic animals and vehicles to, from or within a fly area;

(b) restricting such movement to certain defined routes;

(c) restricting such movement to fixed periods of the day or night;

(d) providing that any such movement shall not take place unless it be interrupted at certain intermediate points for prescribed periods;

(e) providing for the inspection by duly authorised officials of persons, domestic animals and vehicles upon such movement taking place, for the purpose of detecting the presence of tsetse flies and for the introduction and enforcement of measures for ridding such persons, animals or vehicles of tsetse flies;

(f) providing for the introduction of any other measures necessary to prevent the spreading of tsetse flies.

Introducing the Bill in the Legislative Assembly, the Minister of Agriculture and Lands explained that the measure was merely of a precautionary nature. There was a

danger of the fly being conveyed by mechanical means, such as motor transport, a danger which did not exist in the past. It was therefore necessary to bring in a Bill which would give the Government power to make regulations to meet the menace. There was no wish to inconvenience any industry or individual, and everything would be done to prevent any hardship. The Minister indicated that, in consultation with local residents, certain routes would probably be laid down by which motor traffic must travel to and from a fly area, and there would be certain points where traffic will be stopped for inspection. Power might, he said, be taken to stop traffic altogether, but that would not be done unless it was necessary.

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**The Imperial Institute.**—We have received a copy of the annual report of the Director of the Imperial Institute for the year 1928, which records in considerable detail the manifold activities of this important organisation. To most of our readers the name of the Imperial Institute is familiar, for we have from time to time published reports in this Journal furnished by the Institute on products and commodities submitted by the Colony for examination. Others have visited in person the Imperial Institute, which is situated at South Kensington, London, and have seen much to interest them, including the Southern Rhodesia Court, where the activities of the Colony are depicted. To those who have no knowledge of the Institute we might explain that it was founded as the Empire Memorial of the Jubilee of Queen Victoria. Its principal object is to promote the development of the commercial and industrial resources of the Empire. In other words, the Institute "acts as a clearing house of information regarding the primary products of countries within the British Empire and their potential economic utilisation."

Under the provisions of the Imperial Institute Act of 1925 the Institute was re-organised and placed under the control of the Department of Overseas Trade. The Parliamentary Secretary of that Department is the responsible Minister and is chairman of the Board of Governors. This body consists of the High Commissioners of the Dominions

and India, representatives of the Colonial Office and of certain other Government Departments, and the Crown Agents for the Colonies, with additional members representing scientific and commercial interests. The Director of the Institute is Lieut.-General Sir William Furse, K.C.B., D.S.O. On 1st July, 1925, the Imperial Mineral Resources Bureau was amalgamated with the Imperial Institute, and the fifteen advisory technical committees of the Bureau were reconstituted in the re-organised Institute.

The technical work of the Institute is carried out by two principal departments, viz., a Plant and Animal Products Department and a Mineral Resources Department. An Advisory Council for each of these groups of products has been appointed, Sir David Prain, C.M.G., C.I.E., F.R.S., being chairman of the Plant and Animal Products Council and Sir Richard Redmayne, K.C.B., chairman of the Mineral Resources Council.

A number of advisory technical committees, consisting of authorities on the various groups of raw materials, co-operate in the work of the Institute, in association with the advisory councils, and a close touch is maintained with producers, users, merchants and brokers. Valuable help can thus be given by the Institute to persons interested in the development of the resources of raw materials throughout the Empire.

The Institute maintains a special service for dealing with enquiries relating to the sources, production, uses and marketing of raw materials and for collecting and disseminating general and statistical information on these subjects. This service is available for the use of individuals and firms, as well as of Government Departments, without charge.

The laboratories of the Institute are specially equipped for the chemical and technical examination of raw materials of all kinds. Full reports are furnished on the composition, uses and value of materials submitted. By its close association with the users of raw materials the Institute is able to arrange large-scale trials of promising materials when necessary. Special analyses and investigations are undertaken for firms or private persons in any part of the Empire on

payment of appropriate charges. Applications for such investigations should be addressed to the Director.

In the public exhibition galleries of the Institute there is a permanent exhibition of the natural resources, scenery and life of the people of the Dominions, India and the Colonies. It is the only exhibition of the kind in London where all the countries of the Empire are represented under one roof. During the past year 345,961 members of the general public visited these galleries, or a weekly average of 6,653. Lectures and demonstrations in the galleries are given daily to school teachers and school children by the guide lecturers. Reference to the Southern Rhodesia Court is made in the report in the following terms:—"The reorganisation of this Court resulting from the special grant made by the Government is still in progress. The Court cannot be completed until the photographs asked for are received. The exhibit of Rhodesian cigarettes and pipe tobaccos has been replaced by new material supplied by Messrs. Rothman. A bronze statuette of Cecil Rhodes, by John Tweed, has been presented by the British South Africa Company. Two double-slope show cases for the better display of the mineral collections have been installed."

We advise all Rhodesians when in London to make a point of visiting the Imperial Institute, where they will be able to see for themselves the valuable work which the Institute is doing in buiding up the fabric of Empire.

# Poultry Husbandry.

## ARTIFICIAL INCUBATION, BROODING AND REARING OF CHICKENS.

*(Concluded.)*

By H. G. WHEELDON, Assistant Poultry Expert.

**Heated Brooders.**—Artificially heated brooders are not necessary or required for small or medium-sized flocks of chicks in warm localities or countries. Suitable arrangements can be made to equip the foregoing cold brooder with temporary artificial heat if required in cold localities or where small numbers of chicks are to be removed from the incubators in very cold, cloudy weather. This, however, involves very careful attention and judgment, as it requires hand regulation of the temperature to prevent over-heating.

Of the many types of artificially heated brooders, the coal-burning portable brooders are recommended for the brooding of large flocks in a brooder house. They meet, with practically no exceptions, all the requirements laid down for a good brooder. They meet these requirements under more conditions than any other type of brooder.

**Brooder House.**—Portable brooder houses are necessary for the best success in rearing chickens. There is a distinct advantage in being able to avoid the use of the same ground year after year as a range for chickens. If it is not possible to use a portable brooder house, a double or triple yarding system should be provided.

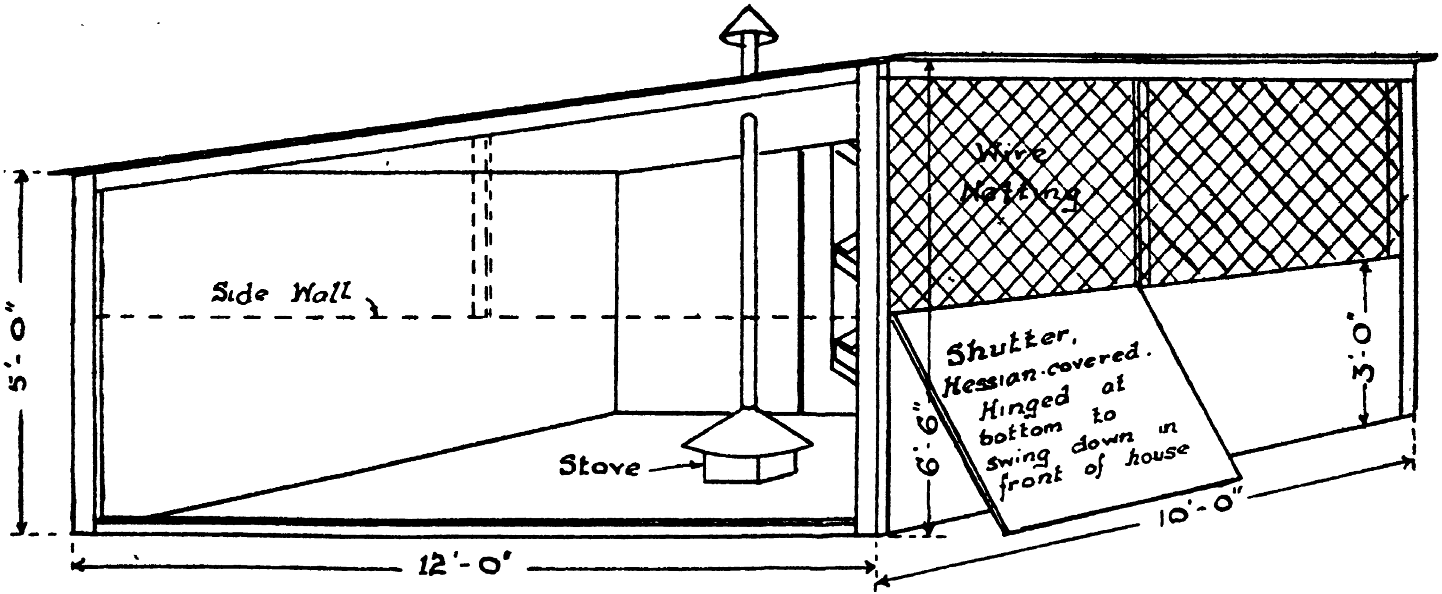
There is a tendency to use houses which are too small. The small house is too easily over-heated, which results in corner crowding, and is harmful. Portable brooder houses for coal-burning stoves should be built as large as can be

moved conveniently. A house 10 ft. by 12 ft. should be the minimum. The type of house is not important, provided it is light and cosy, with conveniences for ventilation, such as hinged, cloth-covered frames as shutters. The common lean-to type of building, 6 ft. 6 ins. high in front and 5 ft. at the back, is satisfactory for a house which is not more than 12 ft. deep. The uneven span of roof would be more satisfactory for a house which is 14 ft. or 16 ft. deep, the front wall being 6 ft. or 6 ft. 6 ins. high and the rear wall 5 ft. 6 ins., with a height of 7 ft. 6 ins. at the apex of the roof. In houses with these dimensions the apex of the roof should be 6 ft. from the front wall.

The accompanying diagram (Fig. 2) illustrates a brooder house which is considered satisfactory. It can be moved conveniently on most farms. The house consists of a wooden frame with water-tight roof. The sides, back and front should be covered with wire netting, attached to the inside of the framework. The back wall and lower part of the sides and front should consist of some light weather-proof material, such as asbestos roofing, malthoid or rubberoid, etc. This should be 3 ft. 3 ins. high on the sides and front wall. The openings above this may be fitted with hinged wooden frames covered with fine hessian, hinged at the bottom to swing down on the outside of the house. These shutters may be closed for protection when necessary or opened for ventilation or to admit sunshine as may be required.

**Brooder Management.**—The brooder should be located in the rear of the house equidistant from the rear and the two side walls. This position avoids over-heating the space between the brooder and the walls; it also permits a wide range of temperature between the brooder and the front wall, a condition which is very desirable.

The brooder should be ready for the chicks at least two or three days before the chicks arrive. If it is a new brooder make sure the regulator is properly adjusted and that it works freely. Three hundred to four hundred chicks in a coal-burning brooder can be handled to better advantage that a larger flock, regardless of its higher estimated capacity or the size of the hover. When too many chicks are brooded




PORTABLE BROODER HOUSE, WITH BROODER STOVE

[Side of House Removed.]

together, good feeding so that all the chicks have a fair chance is more difficult, and will increase the number of culls unless the poultry keeper is thoroughly experienced. Do not attempt to brood chicks of different ages in the same flock under the same hover, unless the brooder house is divided with low wire netting partitions. The brooder house floor should be covered with clean sand, chaff or finely-cut grass to a depth of 2 ins.

While the brooder is empty it should be regulated to a temperature of approximately 95° under the outer edge of the hover about 1½ ins. above the litter. The regulation of the brooder should be done with the front shutters of the brooder house open. Fresh air is essential for the health and sturdy development of the chicks. Follow the manufacturer's instructions in regard to the regulation and operation of the brooder, especially in regard to fuel.

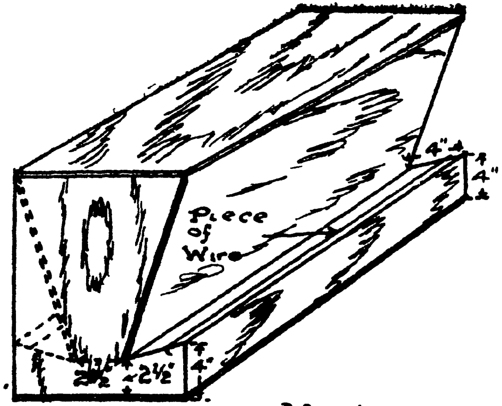
**Feeding.**—It is management from first to last that counts in the successful rearing of chicks. The successful feeding of chicks is not a difficult problem; almost any sweet, clean, dry nitrogenous food given regularly is all they require in the way of food, with fresh, clean water, fine grit and bonemeal always kept in front of them. When the chicks are from twenty-four to thirty-six hours old they will be ready for their first feed, which should be given preferably after they have been removed to the brooder, when they should be provided with a shallow vessel containing water and a little grit. Two or three pieces of stick or straw may be allowed to float on the surface of the water, which the chicks will peck at, and soon learn to drink. Provide also a shallow tray, into which a little dry bran or oatmeal should be placed. At frequent intervals during the first two days their attention should be drawn to the food, either by tapping the food with the forefinger or by taking a pinch of the food between the thumb and finger and allowing it to sift down from a few inches above the food tray, at the same time imitating the call of a hen. By these simple means chicks can be taught to eat and will soon learn to care for themselves. From the third day a little munga or commercial chick food or bread crumbs soaked in milk and squeezed dry may be given in conjunction with the dry bran, and fed at frequent and regular intervals.

Growing birds want variety, if for no other reason than to maintain their appetites, and there must be no stinting during their chicken stage. There is an axiom in the management of stock that the "feeding must be above the breeding" if improvement is to be obtained. While it is true that better results would be secured by better methods of feeding, it is equally true that still better results would be obtained by having the stock properly bred and then feeding well. In this way the greatest return would be derived from a given amount of food.

The object of the poultry breeder to-day is to economise in almost every branch of his business, but there is one place where stinting is false economy, and that is in the feeding. It is much better to hatch fewer birds and feed them well than a large number insufficiently fed.

The bran and pollard, to which a little charcoal is mixed, may be kept before them all the time in a small hopper covered over by fine mesh wire to prevent them from scratching and wasting the food. Grit and water are also necessary at all times, as well as a little finely-cut tender green vegetation. At the end of the first week or ten days a little clean meat meal or blood meal may be added to the mash, as well as bone meal, which is necessary for all ages of growing chicks, and the same may be said about milk. As the chicks grow older, gradually accustom them to a large range or run, and place this on grass land if possible. At the end of the first week or ten days the oatmeal may be substituted entirely by a good commercial chick grain mixture, and throw it in some loose litter, which will cause the chicks to have exercise in scratching for it. Do this at least four times a day, giving the grain mixture often, and feeding but a little at a time is the rule for feeding young chicks. When the chicks are six weeks old give them a mixture of larger grain, such as cracked wheat, crushed mealies, munga and linseed. By the time the chicks are four to six weeks old the principal dangers of chickenhood are past, and at this stage they may be removed or weaned from the brooder to suitable coops. •

The chickens intended for breeding stock or layers may be allowed to run out in the fields or large runs, where they can have some freedom, but they must also be given a liberal



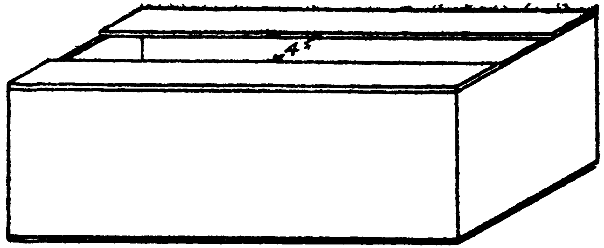

No 1

FEED HOPPER FOR ADULT STOCK

Constructed from petrol box, with either one or two feeding sides.

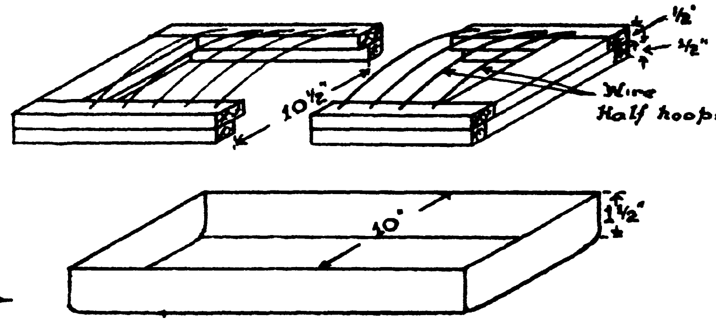
The same pattern, of larger dimensions, may be used for growing chickens, and mature stock

No 3




SUITABLE MASH HOPPER FOR ADULT STOCK

Constructed from half of whisky box, or petrol tin




No. 2. Dry-mash Hopper for Chicks.

Petrol tin cut down

supply of nourishing food to build up strong, healthy, vigorous birds. Reasonable precautions should be taken to ensure steady, continuous growth. Guard against insect vermin and keep the coops clean and dry. Chickens intended to be kept for laying or breeding purposes should be carefully selected when quite young; the first selection being made to the best advantage when they are eight weeks old. Select all the cockerels and pen them apart from the others. Those which have been kept back by ailments or through any other causes should be separated from the more robust ones and placed in a separate pen. Self-feeding hoppers are of the greatest advantage in feeding poultry of all ages. In using hoppers for the dry mash time and labour will be saved. This method of feeding is the cleanest, easiest and best way to feed poultry. They may be filled every second or third day or once a week, according to the size of the flock which is being fed from hoppers, which may be left open all day and the chickens allowed to help themselves. In addition to a dry mash they must be supplied with a grain mixture. At the age of four to five months they may be fed on the same grain mixture as the laying hens.

There are many grains and meals obtainable in Rhodesia which are suitable for feeding poultry, and a good combination may be made up to suit the poultry keeper from the kinds of grain at his disposal. The accompanying menus have proved satisfactory, and will serve as a guide for general use.

The following measures by volume and weight are the equivalent proportions in each case. A petrol tin is the measure used, filled but not pressed down. In considering the digestibility and the general analysis of the foods suggested, the ratios of the rations made up from the proportions indicated are sufficiently near to a ratio of 1 : 4.5. It is not necessary nor is it possible to be very precise in this matter, for two individual birds or breeds might do equally well on a very much wider or more narrow ratio; palatability and the quality of the ration are of far greater importance. To force growing stock or laying hens to eat food that is not appetising to them will retard their growth or at once reduce the egg supply. It is the rearing of the young stock,

more than any other factor, that vitally affects the ultimate results obtained in poultry keeping.

## MENUS.

### First Ten Days.

| Grain Mixture. | Mash Mixture. |
|---|---|
| 1. Pinhead oatmeal or commercial chick food No. 1 or munga. | Wheat bran, 2 parts or 20 lbs.<br>Pollard, 1 part or 18 lbs.<br>Powdered charcoal, ½ oz. to 1 lb. of mixture. |

Fine grit, separated milk, clean water.

### After Ten days.

| Grain Mixture. | Mash Mixture. |
|---|---|
| 2. Commercial chick food No. 1 and some oatmeal or munga. | Wheat bran, 4 parts or 40 lbs.<br>Pollard, 2 parts or 36 lbs.<br>Mealie meal, ½ part or 14 lbs.<br>Meat meal, 3 per cent.<br>Bone meal, 3 per cent.<br>Charcoal, 3 per cent. |

Grit, milk curd, green food, clean water.

### From Six Weeks upwards.

| Grain Mixture. | Mash Mixture. |
|---|---|
| 3. Crushed mealies (fine), 4 parts or 100 lbs.<br>Munga, manna or millet, 2 parts or 72 lbs.<br>Crushed beans or peanuts, 1 part or 24 lbs.<br>Wheat or buckwheat (or both), 1 part or 30 lbs.<br>Linseed or sunflower seed (small), ½ part or 9 lbs. | Wheat bran, 4 parts or 40 lbs.<br>Pollard, 3 parts or 54 lbs.<br>Mealie meal, 1 part or 28 lbs.<br>Meat meal, 5 per cent.<br>Bone meal, 5 per cent.<br>Lucerne or sunflower leaf meal, 2 parts or 20 lbs.<br>Charcoal, 5 per cent. |

Grit, milk curd, clean water, green food (if obtainable).

### Laying Hens.

| Grain Mixture. | Mash Mixture. |
|---|---|
| 4. (a) Crushed mealies, 4 parts or 100 lbs.<br>Sunflower seed, 1 part or 18 lbs.<br>Munga, 1 part or 36 lbs.<br>(b) Crushed mealies, 4 parts or 100 lbs.<br>Crushed peanuts or beans, buckwheat, 1 part or 24 lbs.<br>Sunflower seed, 1 part or 18 lbs. | Wheat bran, 4 parts or 40 lbs.<br>Pollard, 4 parts or 72 lbs.<br>Mealie meal, ½ part or 14 lbs.<br>Lucerne or sunflower leaf meal, 2 parts or 20 lbs.<br>Meat meal, 8 per cent. to 10 per cent. |

Grit, oyster shell, charcoal, clean water.

All the deaths of young chicks are not due to disease. Heavy losses occur from several troubles, the causes of which are often overlooked.

**Over-crowding.**—When large numbers of chicks are brooded together there is some danger of over-crowding, and many chicks are often smothered. This generally happens at night. The same applies to small numbers of chicks when closely brooded in fireless brooders and suitable ventilation in the brood chamber is not provided. Some protection or covering should be provided during the first few nights after removing or weaning the chicks from the brooders, as this is also a source of danger and over-crowding will result, especially on chilly nights. Chilling and crowding may occur also outside the brooder. Chicks that are unable to find their way back to the brood chamber or young chicks that are left out too long after sunset will become chilled and will crowd together for protection. It is particularly important to avoid chilling during the day and over-heating at night through lack of ventilation when the chicks are very young.

**Bowel Trouble.**—Any disorders of the digestive system of the chicks caused by chilling, improper feeding, sun-warmed water and over-heating or crowding are likely to cause bowel trouble, which results in a lack of vitality or often heavy mortality. Many of these digestive disorders can be avoided by not feeding the chicks too soon after hatching. Always give clean, fresh, dry foods and careful attention to the brooding at night to avoid over-heating; prevent chilling during the day and provide shade for the chicks and drinking water.

**Sanitation.**—Sanitation checks disease and must be regarded as one of the important considerations in successful chick rearing. Many common diseases and troubles of both old and young stock can be avoided by following sanitary principles. Proper sanitation means raising chicks on fresh ground by moving the brooder from place to place or digging over and cropping contaminated ground or the permanent rearing pens in the off-season, cleaning and renewing the litter as may be necessary, consistent cleaning of the utensils and disinfecting the brooders after each lot of chicks are weaned.

**Cannibalism or Toe-Picking.**—Cannibalism is often associated with poor hatching or close confinement in the brooders of young chicks, and is often brought on in older chicks by a lack of exercise and animal food or other deficiencies in their ration. Much of this trouble can be avoided by brooding chicks in small lots or by getting them out of doors as much as possible, by giving them proper nutrition and providing them with some means of keeping them busy. Plenty of protein and green food are essential; sprouted cereals in a little soil contained in a shallow, wire-covered box and placed in the chick runs or brooder house will help to keep the chicks busy.

**Attention to Details.**—Chicks are delicate during the early period of their life, especially in cold weather, and attention to details will count in their successful care. Recommendations in the care and management will not give satisfaction without the use of good judgment on the part of the attendant. Any methods which have proved satisfactory in the past should be carried out with a definite plan in the management. Common sense and careful attention are particularly important in raising baby chicks in cold weather to prevent mortality and raise profitable layers for the future.

Fig. III.
Here the cowpeas were broadcasted between the rows of maize at the rate of 35 lbs. of seed per acre at the time of the last cultivation of the maize, 23 days after Fig. II. The maize has been topped for silage.

Fig. I.
Cowpeas planted by hand in row between maize plants when maize were well established and about 4 to 6 inches high.

Fig. II.
As for Fig. I., but the cowpeas were planted after the first cultivation of the maize when the maize was 12 to 14 inches high.

# Maize under-sown with Cowpeas on the Sand Veld.

The great need of sand veld soils generally in this Colony is organic matter and nitrogen, particularly the former, and the outstanding problem confronting the farmer on this type of soil is the maintenance of the supply of these all-important soil constituents. They are best maintained by the application of kraal and farmyard manure, but the supply of manure is usually very inadequate, and so the farmer must have recourse to the best substitute for farmyard manure, viz., the ploughing under of a leguminous green crop.

Often the farmer is unable, for financial reasons, to surrender any of his ploughed land for a whole season to the growing of a green manure crop, and the accompanying photographs illustrate one of the best methods of avoiding this, whilst at the same time growing the necessary green manure crop for ploughing under.

Cowpeas or kaffir beans are sown between the rows of growing maize, and after the removal of the maize crop the cowpeas are ploughed under. The photographs are of experiments carried out at the Tobacco Experiment Station, Salisbury, during the season 1928-29. Figure 1 shows cowpeas planted by hand between the maize plants in the row, when the maize was 4 to 6 inches high, on 17th December. Figure 2 shows cowpeas planted in the same way ten days later, on the 26th December, when the maize was 12 to 14 inches high. Figure 3 shows cowpeas broadcast by hand at the rate of 35 lbs. per acre and covered by the cultivator at the last cultivation of the maize on 17th January. The photographs were taken on the 8th May, and it may be noted that the maize had then been topped for silage.

The cowpeas broadcast at the last cultivation of the maize have done best, and an excellent growth of green material for ploughing under obtained. Those planted when the maize was 4 to 6 inches high are not quite so good, and those

planted when the maize was 12 to 14 inches high have made very much poorer growth. Broadcasting the cowpeas or kaffir beans at the last cultivation of the maize, about mid-January, is the least expensive method, and gave the best growth, and this is a system of partial green manuring on sandy soils which can be strongly recommended. An early crop of cowpea seed may be reaped for sale, and to supply seed for the next season. As far as can be judged by eye, the yield of maize has been little or not at all reduced by the under-sown crop of cowpeas.

S. D. T.

# Farming in Matabeleland.

The following notes are amplified by some extremely interesting illustrations of crops grown during the past season on Major R. R. Sharp's farm, Whinburn, Redbank, near Bulawayo.

Plates Nos. 1 and 2 depict two maize crops on either side of a dividing "service" road. The soil in both fields is entirely similar, and until the season 1927-28 had been under crop for the same length of time and had received similar treatment in all other respects.

In 1927-28 the field shown in Plate No. 1 grew maize, while field No. 2 grew cowpeas, which were reaped for seed and hay, the roots only being ploughed under. This season both fields were planted to maize on practically the same date and with an identically similar fertiliser treatment. The maize on field No. 2 following cowpeas will return a really good crop, which Major Sharp estimates at 16 bags an acre, while that on field No. 1 is not likely to yield more than 6 bags an acre, and will almost certainly not give more than half the yield returned by the maize after cowpeas.

The poor maize crop depicted in Plate No. 1 was under-planted with bush cowpeas at the time of the last cultivation of the maize, and when the photograph was taken on the

Illustration No. I
Maize after maize (inter-sown with cowpeas) Major R. R. Sharp's farm
Whinburn, Redbank, near Bulawayo.

Illustration No. II.
Maize after cowpeas reaped for hay and seed. Major R. R. Sharp's farm
Whinburn, Redbank, near Bulawayo.

Illustration No III.
Maize on "Gusi" sand at Major R. R. Sharp's farm, Whinburn, Redbank, near Bulawayo

20th March, these cowpeas were growing well and were 12 to 15 inches high. Major Sharp's intention was to cut and stook the maize, take a picking of seed from the cowpeas and plough under the vine residue. Information now received states that these cowpeas are yielding about 250 lbs. of shelled seed per acre. The soil of these fields is the reddish sand common to the sandstone areas of Matabeleland.

Plate No. 3 shows this year's maize crop on a "Gusi" sand section of the same farm. This soil in appearance is practically a pure, whitish-grey sand, and, as the following analysis shows, it was originally of extremely low fertility.

| | Top-soil. | Sub-soil. |
|---|---|---|
| Phosphoric oxide ... ... | 0.003% | 0.002% |
| Nitrogen ... ... ... ... ... | 0.05% | 0.04% |
| Potash ... ... ... ... ... ... | 0.0005% | 0.0003% |
| Organic and volatile ... | 1.7% | 1.3% |

In 1926-27 the field grew tobacco with the usual fertiliser treatment accorded to this crop.

During 1927-28 most of the field was under cowpeas for hay and ground nuts, but a small part was planted to maize. In 1928-29 that portion under legumes the previous year was planted to maize with 100 lbs. per acre of double complete maize fertiliser, while the part under maize the previous year received in addition a very light dressing of kraal manure. At the time the photograph was taken the maize crop looked like yielding 10 to 12 bags an acre, and Major Sharp now writes that he expects to reap nearly 14 bags an acre from this land.

These notes and illustrations serve to indicate the manner in which sandy soils of indifferent, and even very low, fertility can be improved and made to yield remunerative crops by a judicious system of crop rotation and the use of artificial fertilisers.

H. G. M.

# Fruit Growing in Southern Rhodesia.

## THE HOME ORCHARD.

(*Concluded.*)

By G. W. Marshall, Horticulturist.

**Pruning.**—The theory of pruning is based on certain observed facts, and the ultimate objects are:—

(a) To produce a tree of a desirable shape.

(b) To permit of economical cultural operations.

(c) To reduce or stimulate the production of wood or fruit-bearing growth, as the circumstances require.

(d) To remove injured, diseased or worn-out growths.

To accomplish these the farmer must take into consideration rules or laws which appear to almost invariably operate in the growth of plants; those of primary importance may be set out as follows:—

(1) The vigour of a tree is dependent upon its leaf surface.

Considering that the leaves are practically the lungs and stomach of the tree, this statement is tantamount to saying that the plant which has the largest transpiring and assimilating capacity must, when food is unlimited, be the strongest grower. This law has an important bearing on all pruning operations whilst the tree is in a state of vegetative activity.

(2) The nearer a shoot approaches a vertical position the stronger will be its growth. This is founded on an unvarying law of nature, by virtue of which the sap of plants flows more freely to the highest point of each shoot.

(3) The nearer a shoot approaches a horizontal position, so does its vigour diminish.

This is only a natural corollary to the previous statement. These two rules have a most important bearing upon the selection of shoots required for wood or fruit production. Vertical shoots usually run to wood above, while those tending towards a horizontal plane turn to fruitage. This goes to show that fruit bearing is an attribute of modern weakness rather than of great vigour.

(4) The lesser the number of buds upon a branch the stronger will be the growth made by each individual shoot arising therefrom.

This may be put in other words, namely, that heavy pruning of the top tends to increase the production of strong wood growth. Under natural conditions of growth there is a balance between root and top. They mutually nourish each other, but when suddenly the top is reduced, without the inference of disease, the remaining buds make haste to utilise the extra volume of sap sent up to them. Partly for this reason, when pruning newly set trees, the number of buds is reduced by pruning away a large portion of the top shoots.

(5) If the root system be reduced the vigour of the top growth will be correspondingly diminished.

It is this fact which causes orchardists to prune the roots of rank growing unfruitful trees. Again, when young trees are removed from the nursery, many roots are cut off or so damaged as to necessitate their amputation. To counteract this the top growth must be curtailed, otherwise stunted development or death may result.

(6) When a number of shoots are growing at different levels upon the same tree, generally the topmost shoot absorbs most sap and outgrows those below.

This is seen in every tree, and gives rise to the practice of pinching the growing tips out of the highest shoots on young trees so as to lessen their natural advantage.

(7) Deformations of any kind, such as those produced by wounds or compression of sap vessels, diminish the activity of those parts situated above them.

The correctness of this statement is clearly shown in the effects produced by cinctures, bruises, large wound scars, partial fractures, or the hardening of the bark caused by sun-scald.

(8) Within certain limits, the fruit production of any plant or tree diminishes with the increased development of its vegetative growth.

In other words, when a mature tree is forced into making vigorous growth, its production of fruit is lessened. Again, young trees, when properly nourished and trained, do not fruit freely until they have assumed considerable dimensions and have branches usually growing in a lateral direction, which make weak growth. This also points to the fact that the fruit-bearing habit arises from a quiescent condition in the plant or branch. To quote an extreme case, a superabundant crop of oranges is usually regarded as a sign of the tree having begun to decline.

(9) The smaller the number of fruits the better their quality and size.

This is the chief reason why fruit growers thin their crops at an early stage of development. Pruning also is utilised to the same end. By judicious thinning out of the fruiting wood the possible number of fruits is lessened, and each one retained receives a larger share of the plant food elaborated.

**The Seasons for Pruning.—Winter Pruning.**—Winter pruning, which is practised when the wood has ripened and the leaves have fallen from deciduous trees, is most important. When the tree is devoid of foliage, the pruner can see the position of each branch and weigh its present use or calculate its future value.

The general effect of winter pruning is to stimulate vigorous growth when the growing season again begins. Winter pruning may be calculated to ensure wood growth for subsequent fruit crops rather than actual fruit production. It is of the greatest value in shaping young trees or renovating older trees which lack vigour.

The objects of winter pruning may be summarised as follows:—

1. To regulate the shape of young trees.
2. To ensure fruit wood formation on mature trees.
3. To regulate the fruit crop by the judicious cutting out of unnecessary fruiting wood.

**Summer Pruning.**—Summer pruning is the term used to define those operations which are performed upon a tree while in active growth. The objects are:—

(a) To suppress all undesirable growths when they first appear.

(b) To admit sufficient air and sunlight to the innermost branches, thus permitting them to mature naturally.

The suppression of all undesirable growths should be performed during the early part of the growing season. Other summer pruning is best performed in the latter half of summer or when there is no danger of the trees making new growth to replace the shoots taken out.

**The Desirable Tree.**—The ideal shape of a mature deciduous fruit tree is that of a goblet or wine glass, that is to say the tree has a straight short stem from which arise the main and secondary arms, while the centre is moderately open. See Fig. 5.

**Proper Pruning.—First Year at Planting.**—As previously stated, young trees should be headed back at planting time, knee high for unshaped deciduous trees and 30 inches for citrus trees. When heading back at planting time, it is often found that a good framework has been produced in the nursery. If the branches arise on the main stem at the desired distance from the ground (18 inches deciduous, 30 inches citrus), select from three to six well spaced shoots arising from different points on the main stem and cut out the rest. The shoots retained should then be shortened back to about 9 inches in length or in proportion to their development (6 inches for weak to 12 inches for very strong). Three to four main arms are sufficient for most fruit trees. Plums with advantage may have up to six. The heading back of the main arms should be done in such a manner as to have all the cuts above level; if uneven, the highest one will outgrow the rest and produce a one-sided tree. When viewing

a recently headed back tree from above, the cut surfaces of the three armed tree should form a triangle, if four a square, and if six a hexagon. See Fig. 4.

**Summer Treatment.**—The first growth that takes place after planting, if correctly treated, will soon form a well-shaped tree. Two shoots should not be allowed to develop from one spot. The weaker shoot should be rubbed off when still young and tender. If double shoots are allowed to develop from one spot on the main stem or main arms of a tree, they will form a Y crotch, which is objectionable owing to the likelihood of the crotch splitting with the weight of the fruit when the tree commences to bear.

All those shoots that have a tendency to cross or crowd each other should be suppressed. The energy required to produce these unnecessary shoots will then be deviated to the desired ones, which in turn will grow more vigorously. Shoots having a tendency to outgrow the rest should have their tips pinched back; this check generally has the desired effect of balancing the new growth. If the heads of the young trees are inclined to become too dense, it is advisable to thin out some of the growth. Air and light are essential for good healthy development. All shoots arising on the main stem should also be rubbed off as they appear; neglect in this respect will result in multi-stemmed and mis-shaped trees.

In training during the growing season the aim should be to encourage at least two good shoots to develop from each main arm, one from either side. Trees with three main arms will then have six secondary arms, those with four will have eight, and so on.

**Second Year's Winter Treatment.**—If the trees have been well shaped during their first year's growth there is very little to be done during the second year's winter pruning when the leaves have fallen. All that is necessary is to cut any badly shaped, diseased or crowded shoots that may have been overlooked during the previous summer treatment. In trees with a natural spreading habit (apricot), the erect growing shoots should be retained for the secondary arms or leaders (see Fig. 5, parts of a tree, for explanation of these terms). With erect growing trees (Wickson plum), retain

shoots to form the leaders from those with an outward growing tendency. Adopt long pruning for best results; this means the non-cutting or shortening back of the retained fruiting or other wood. All shoots that are not removed must be cut off close up to the limbs that form the framework of the tree; stubs are objectionable, as they may either produce an abundance of unnecessary growth or die back and so impair the health of the tree.

In all pruning operations care must be exercised not to injure the tree unnecessarily. Use good and sharp pruning tools, and see that all cuts exceeding ½ inch in diameter are coated with a suitable oil paint; this prevents water from entering the wound, also decay.

**Second Year's Summer Treatment.**—This is similar to the summer treatment previously mentioned, comprising rubbing off all undesirable double growths, suckers and shoots that have a tendency to cross or crowd each other.

Early maturing varieties such as plums may have their strong lateral shoots broken back, but not detached, to about one-half their length. This breaking back should be done about January or sufficiently early in the growing season to enable the lower half of the treated shoot to form fruit-producing wood. This treatment, too, is recommended for large trees in vigorous growth. In many cases apple trees, if left to themselves, will have a tendency to produce one or more long shoots. When this occurs these shoots should be pinched back when about 9 inches in length to induce branching.

**Third and Subsequent Years' Treatment.**—From now on the aim is to prune for fruit. If long pruning is adopted, summer pruning will be found to be of the greatest importance, as it will enable the grower to suppress at the correct time all unnecessary growths, and by the breaking of strong laterals induce good fruiting wood to form where it is wanted.

The winter treatment should then be confined to the cutting off of the broken points of the summer treated laterals, fruiting wood where crowded should be thinned, and leading shoots that grow too high should be shortened. When heading back a tall tree, select an outward growing

lateral that arises some distance below the tip of the leader (see Fig. 6), and cut off just above the one selected. This system of heading back tall growing trees eliminates the possibility of a dense top growth occurring, as would be the case if other heading back methods were practised.

In a tropical climate and with the sun directly overhead in summer, it is not advisable to have the trees open in the centre. To serve as a reasonable protection from sunburn, a few small branches should be left to develop from the secondary arms; these should grow inwardly, but should not be too dense. When deciduous fruit trees are left unpruned they have a tendency to bear heavy crops of small fruit every alternate season and little or no fruit in between. This is due to the trees being weakened through lack of proper care and nourishment, and they are consequently unable to mature a crop of fruit and fruiting wood for the succeeding year, as is done in healthy and well pruned trees.

**Root Pruning.**—Large fruit trees that bear no fruit but grow profusely should be root pruned; this will reduce the tree's vegetative activity and induce fruitfulness.

Root pruning is done by digging a trench round the tree, usually equal to the spread of the branches and about 2 to 3 feet deep. All roots that cross the trench are cut off, and the trench should then be refilled with the soil previously taken out. This treatment is generally effective, but this class of unfruitfulness must not be confused with that due to lack of inter-pollination.

**Unprofitable Trees.**—Many fruit trees on reaching maturity may be found to be unprofitable; the trees may either produce inferior fruit or poor crops. They should be rooted out or top-worked to suitable varieties.

Stone fruit trees, if old, seldom give satisfactory results when top-worked, and should be replaced with young trees. Apple and pear trees may be top grafted to some known good variety. (For instructions on budding and top-working, see *Rhodesia Agricultural Journal*, October, 1923, or Bulletin 471.)

**Trees Fruiting too Young.**—Early fruiting should not be encouraged on young trees, as it is apt to dwarf or affect them to such an extent that they may be of little or no value

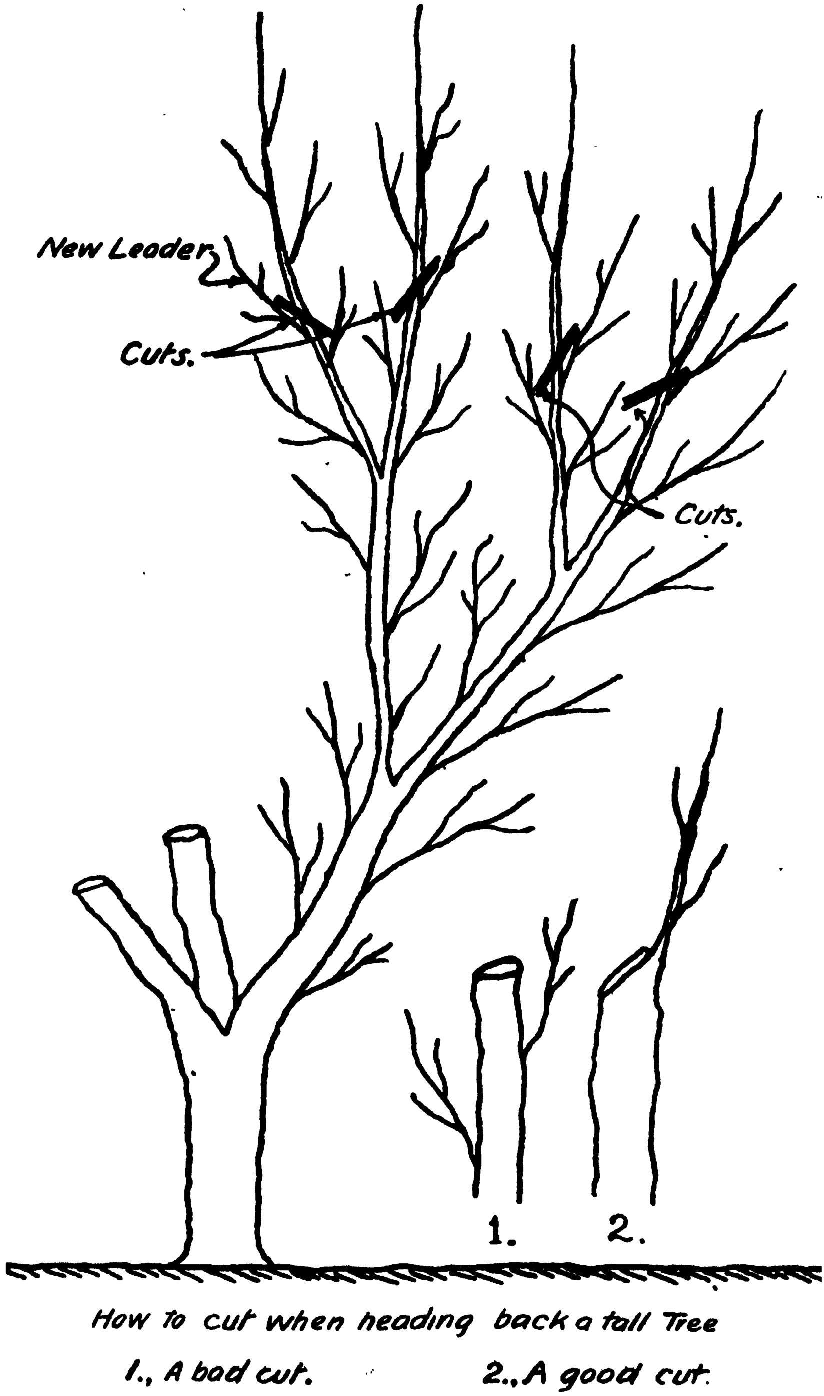

New Leader
Cuts.
Cuts.
1.
2.
How to cut when heading back a tall Tree
1., A bad cut.
2., A good cut.

Fig. VI.

in later years. It should be the aim of every owner to encourage top growth, and to achieve this all fruit must be stripped from the trees as it sets, thereby enabling them to utilise all of their energy for the development of the frame and fruiting wood of the tree.

No hard and fast rule may be laid down for the age at which trees should bear their first crop of fruit; this is dependent on many factors, but for the guidance of those unaccustomed to working with fruit trees it may be as well to give the average bearing age of a few of the more important fruits. These are:—

**Citrus Fruits.**—These often set a small crop of fruit within a year of planting, but they should not be permitted to bear before the third season, and in some cases, when the tree has made a poor growth, not before the fifth season.

**Stone Fruits** (Peach, Plum, Apricot, Almond, Nectarine, etc.).—If the trees make good growth during the first season they may be permitted to carry a little fruit during the second year. The third year, however, is the correct time for them to commence fruiting.

**Pomaceous Fruits** (Pear, Apple, Quince, etc.).—A very wide range of bearing ages is to be found in this group. Some varieties may commence bearing the second or third year after planting; others not for ten or more years. A fair average may then be taken at five years, but on no account should any trees in this group be permitted to bear before the third season, and then only one or two specimen fruits per tree.

**Other Fruits.**—Guava and pawpaw, second year; fig, mulberry, custard apple and mango, third year; avocado pear (seedling), seventh to tenth year.

**Fruit Thinning.**—Many fruit trees, although well pruned and cared for, may have a tendency to produce more fruit than they are capable of maturing, the resultant crop often being very small and unsuitable for the home requirements.

All trees should be examined a few weeks after blossoming, and those that set too heavy a crop should have the fruit thinned out to enable the tree to safely carry the load and at the same time produce good sized fruit.

Fig. 7.
Old and neglected pear tree before pruning.

Fig. 8.
Same tree as Fig. 7, after pruning.

By thinning a fruit crop it is often found that it is possible to produce an equal weight of good large fruit from a tree that has been correctly thinned as would have been the case had the whole crop of fruit been retained. To obtain the best results fruit thinning should be carried out when the fruit is still small, as late thinning is unsatisfactory. Every owner must use his own discretion when thinning fruit, as he will be the only one capable of gauging the fruit-carrying capabilities of his trees.

To assist those undertaking this operation for the first time it may be advisable to lay down a few rules to be observed in thinning, namely:—

(a) When fruit is borne in clusters it is advisable in most cases to reduce the clusters to three fruits.

(b) Fruits borne along the entire length of lateral shoots: these should be thinned down to one to four fruits, or in accordance with the vigour of the shoot.

**Harvesting and Storing.**—All fruit should be carefully gathered and placed in padded baskets or boxes. It should be handled much in the same way as eggs, for all bruised fruit will have its keeping quality impaired. A ladder should be used when necessary; do not pull the branches down or they may be broken, and if this happens the shape of the tree may be ruined. Many years' work is necessary to re-shape broken trees.

Some fruits ripen better when stored in the house or store. These varieties if left to ripen on the tree produce fruit of an inferior quality, generally mealy and unpalatable. Wickson plums and most apples and pears must be gathered before ripe if the best flavoured fruit is wanted. When harvesting pomaceous fruits such as pears, apples, etc., it is extremely important that the fruit be neither too green nor too ripe, but there are a few exceptions to this rule. An excellent test, although not always dependable, to ascertain the correct stage for harvesting the pear in particular is one in which the fully developed fruit is gently lifted upward. If the fruit stalk detaches from the twig or shoot easily, the fruit is ready to harvest. A safer test for the amateur is one where the fruit is cut through the centre horizontally to

expose the seed cavities. If the seed is commencing to turn brown the fruit is fit to harvest. But some apple and pear varieties may be found to have brown seeds before the fruit is quite fit to harvest, and here a little experience in picking is necessary.

When harvesting fruit the picker must always aim at the retention of the stem or stalk. Fruit from which the stalk has become detached will decay or wilt more readily, and the keeping properties are considerably impaired. Fruit that does not detach easily must be clipped in the same manner as is done when harvesting citrus fruits.

Harvesting should continue from time to time as the fruit sizes up and is at the correct stage of ripeness. It may sometimes be necessary to pick over a tree several times. Harvesting should take place when possible during the cool period of the day. If carefully handled at harvesting, many varieties of fruits may be stored for several weeks. The fruit may be spread out on shelves or packed in single layers in clean boxes. These may then be stacked one on the other. When storage is contemplated it is as well first to test the keeping qualities as the different varieties ripen, and to do this it is advisable to pick a little fruit at different stages of ripeness. This will soon furnish the desired information as to keeping quality and the best stage of ripeness at which to harvest. Immature fruit will generally shrivel and over-ripe fruit become mealy. The correct stage will give good coloured and well flavoured fruit.

**Irrigation.**—If water is available, trees should never be allowed to suffer for want of it. All trees require water in early spring before blossoming, and citrus trees again when in full blossom.

Irrigate whenever the soil lacks moisture or when the tree leaves are inclined to feel limp (not turgid) when felt in the early morning.

The absence of sufficient moisture soon affects the turgidity of the leaf and is easily detected about breakfast time. If trees have sufficient moisture the leaves will be crisp. Too much water is just as harmful as too little; trees so treated are more susceptible to disease, fruit is inferior in quality and lacks keeping qualities. Never allow water to come

in direct contact with the stems of trees nor apply cold water to fruit trees such as the fig when the soil is hot. This may cause shedding of the immature fruit.

Small and frequent applications of water should not be given; this induces shallow rooting, while most of the added moisture is lost by evaporation. Rather apply water in much larger quantities and at intervals of one month to six weeks, loosening the surface soil after the water has soaked away.

**Manuring.**—All fruit trees should be manured and fertilised from the time they start bearing fruit. Farmyard or kraal manure is the best, for it not only supplies necessary plant foods, but a large amount of humus. This organic matter improves the physical condition of the soil, and is in every way desirable. Necessary soil bacteria are able to increase and liberate other plant foods. If manure is unavailable, green crops must be planted, and these, when grown, should be ploughed or dug in. Leguminous crops, such as beans, peas, sunn hemp, etc., are best; they absorb nitrogen from the air and fix it in the soil through the agency of bacteria present on their roots.

All weeds that are cut out from time to time should be saved, and at the end of the rainy season spread out and ploughed in along with the green crop. In addition to green cropping, artificial fertilisers are sometimes advisable, the quantity to apply varying with the nature and fertility of the soil. There is also the age or variety of tree to consider. Complete fertilisers are as a rule the best, for they contain all the essential plant foods. As a basis to work on, well grown fruit trees should secure 100 lbs. of kraal manure per tree per annum; also a complete commercial fertiliser containing 15 per cent. phosphoric oxide, 7 per cent. nitrogen and 8 per cent. potash. This commercial fertiliser, known as fruit and citrus fertiliser, may be applied at the rate of 1 lb. for each year of tree's age, with a maximum of about 10 lbs. for deciduous and 20 lbs. for full grown citrus and other evergreen fruit trees.

The most convenient time to apply the manure and fertiliser is at the end of the rainy season or when the soil is in good condition for ploughing it in. All manures and fertilisers should be broadcast between the trees (not under

them). This applies to well grown trees which have their root systems well distributed throughout the soil. For young trees the applications may be made nearer the trees, but not nearer than one foot from their stems.

**Cultivation.**—All work connected with fruit growing must be carried out systematically, and a definite programme should be laid down and rigidly adhered to. Every detail of working is an important item and must be attended to at the correct season. There is a right time for all orchard work, and if this opportunity is once missed it is liable to be reflected in the next season's crop and even for longer periods.

It is, unfortunately, a not infrequent occurrence for the orchardist to defer working up the land immediately after the rains have ceased. Thus when the delayed work is eventually carried out a good tilth is not obtained. Incalculable harm may be done to fruit trees by delaying the autumn digging or ploughing until so late that the ground has become too dry for effective tillage, and much of the soil moisture has been lost. On the heavier soils, too, the earth breaks up into huge clods, and it may then take more than a whole season to bring back a good tilth to the orchard.

Instances could be quoted where such delays have occurred in cultural operations, with the result that the crops of fruit then maturing were impaired, and the crops set a few months later were greatly reduced. Delay in carrying out the necessary cultural operations usually spells loss of crop, and these remarks apply not only to cultivation, but to all other phases of orchard work.

Cultivation is beneficial and necessary in many ways to the general health of an orchard. It pulverises the earth and allows aeration of the soil, and the water retaining capacity of the land is increased. Rain more readily penetrates to the deepest layers, and evaporation is checked by the reasonably fine top mulch produced by good tillage.

In Rhodesia we must always be prepared for a possible shortage of rain, quite apart from the certainty of a period of six or seven months when no appreciable rainfall can be expected, and our system of cultivation must be adapted accordingly.

Before the wet season arrives the orchard should be thoroughly cultivated so as to be in a condition to receive the greatest possible benefit from the rains that may fall. When the cultivation is completed, and after the first good rains have fallen, it is advisable to sow a cover crop such as sunn hemp or some kind of bush bean over the whole area between the trees. When the cover crop has attained its maximum growth, and if the rainy season is drawing to a close, or if the orchard soil is not too wet to plough, the crop should be turned under by ploughing first in one direction between the rows with a mouldboard plough to a depth of from five to six inches, and then when the turned under cover crop is sufficiently decomposed and it is not likely to be dragged out of the soil again, the grove should be cross ploughed, this time to a depth of about eight inches. By setting the plough at the greater depth when cross ploughing no vegetable matter will be left on the surface of the soil.

When the ploughing and cross-ploughing have been thoroughly done, the soil should be well harrowed in both directions.

The unploughed soil under the trees must also be dug over at this season of the year, when all the weed growth and fallen leaves will be turned under. An ordinary digging spade is best for this work, as the hoe or fork is more likely to damage roots.

When the entire orchard has been worked by ploughing and digging it should secure fairly frequent cultivation, the period between these cultivations not usually exceeding one month. Cultivation is also necessary when the soil is sufficiently dry after each irrigation.

**Inter-cropping.**—Under some circumstances young orchards may be successfully inter-cropped, but this should not be attempted unless proper cultivation can be given and manure can be liberally applied. Inter-cropping enables the man with limited capital to overcome the initial expenses of cultivation and incidentally leads to regular cultivation between the trees. Tall growing plants such as maize should be avoided, and the inter-crops should be restricted to such as peas, beans, tomatoes, potatoes, etc., whichever suit the conditions best and are likely to be the most profitable.

Where no irrigation is practised inter-planting should only be confined to the rainy season, and then only to such crops as will mature before the approach of the dry season.

**Diseases.**—When considering the question of diseases, adopt the principle that prevention is preferable to attempted cure; most diseases are preventable, few curable. Many home orchards are neglected from the time disease and pests first make their appearance. This would not be the case if growers when establishing their orchards would look upon spraying as one of the essential cultural operations. Many trees planted by the pioneers did well for a time, but when disease made its appearance they were abandoned.

To maintain fruit trees in good and healthy condition, make a practice of spraying annually with a fungicide. Spray in winter before the trees start growth. A good spray for this season of the year is lime sulphur mixed according to the directions on the container. Proprietary lime sulphur is recommended; home-made solutions take time and are so often incorrectly made. This winter spray acts as a tonic to the tree; it is also an insecticide as well as a fungicide. Bordeaux mixture is also a good spray for winter or summer use. It is a fungicide purely and simply. Use the formula 4.4.50, that is 4 lbs. bluestone ($CuSO4$), 4 lbs. quicklime ($CaO$) and 50 gallons of water. For tender plants use half strength—4.4.100. This spray may be used for any disease control. The novice is recommended to use the proprietary prepared Bordeaux. It is usually bought in small quantities from stores stocking horticultural supplies.

In preparing home-made Bordeaux mixture, quicklime of good quality is best. If the calcium oxide content is low more lime must be used.

**Stock Solution.**—Dissolve 4 lbs. bluestone ($CuSO4$) in 4 gallons of water. Use a wooden or earthenware vessel. Metal containers must not be used, for they will corrode and the spray may be spoiled. Next take 4 lbs. quicklime and slake. This is done by adding water gradually to the lime until the burnt lime breaks down and forms a fine powder. When water is added to the lime a chemical change takes place; heat is generated during the process, and if water is added in moderation the slaked lime will become a fine white

powder. This slaked lime is next added to 4 gallons of water and stirred well. We now have two stock solutions containing 1 lb. of lime or bluestone to the gallon of water. To make up the mixture on a small scale procure a wooden barrel and add 10½ gallons of water; next take 1 gallon each of the stock solutions and pour simultaneously into the barrel containing water. If free bluestone ($CuSO4$) is in the mixture it is dangerous to apply it to trees in foliage.

**Test.**—Dip the blade of a clean knife into the mixture after well mixing it, and after a minute's immersion if the blade shows a copper coating more lime water must be added to neutralise the excessive bluestone ($CuSO4$).

Agitate the mixture when spraying. Stock solutions will keep for a considerable time if covered and protected from the air.

Hardy deciduous trees may be sprayed in winter with a solution of 1 lb. bluestone to 25 gallons of water. This is very effective in preventing disease and lichen growth. *It must not be used on foliage or tender plants, for they will be killed.*

**Insect Pests.**—A knowledge of the feeding habits of insects is essential if pests are to be controlled and good sound fruit grown. A simple classification is as under:—

1. Chewing insects.
2. Sucking insects.

When spraying to combat the ravages of chewing insects a poison mixture must be used that will not damage the fruit or foliage. The best spray is arsenate of lead paste, 2½ lbs. to 50 gallons of water. (If powder is used 1¼ lbs. will be necessary.) The spray must be well atomised so that a fine film of poison is left on fruit and foliage when the trees dry after being sprayed. Chewing insects attacking the sprayed trees are poisoned before they do damage. It is sometimes necessary to spray several times during the season, especially when insect pests produce more than one generation during the season. All fruit and foliage chewing insects may be controlled with this spray.

Sucking insects are divided into two distinct classes:—

(a) Those sucking food from the surface of fruit or foliage.

(b) Those sucking food from inner tissues of fruit or foliage.

Surface sucking insects (fruit fly, house fly) are best controlled by baiting attacked plants with a sweetened poison. This must be sprayed on to the foliage of the treated plants or trees in small drops. Use the ordinary garden syringe for applying; keep the mixture off the fruit as much as possible. Try to get bait in the shady part of the trees where the fly rests during the day. This treatment will kill most of the mother flies before they lay eggs. Treatment is started about three weeks before fruit ripens, and is continued to the end of season; in dry weather about every ten days, in wet weather when foliage is dry after each rain. The mixture is poisonous to human beings and animals, and must be kept under lock and key. It is made up as under:—

3 ozs. arsenate of lead, 50 per cent. paste;

$\frac{1}{3}$ gal. treacle, or $2\frac{1}{2}$ lbs. cheap sugar;

4 gals. water.

Dissolve sweetening matter in a little water, mix arsenate of lead, then add full quantity of water. Keep agitated while spraying.

Insects sucking their food from the inner tissues, such as scale of all varieties, must be sprayed or fumigated. The latter method is most effective, but not always possible owing to the cost of necessary equipment. The object in view when treating this class of insect is to burn or suffocate it. Resin wash is one of the best sprays for this work. If the trees are well and evenly sprayed the insects will have a complete film form over them. This when dry will exclude air from their breathing pores and they then die and fall off. Resin wash may be purchased from most firms stocking horticultural appliances, or it may be made up as follows:—

24 lbs. cheap resin (or $2\frac{1}{2}$ lbs.);

5 lbs. caustic soda (or $\frac{1}{2}$ lb.);

$2\frac{1}{2}$ pints fish or cotton seed oil (or $\frac{1}{4}$ pint);

100 gals. water (or 10 gals.).

Heat 15 gallons water to about 150 deg. F., then add the caustic soda slowly and next the oil. When the mixture starts boiling add the resin gradually; keep adding water to prevent boiling over, and boil for about half an hour after all resin has been added. The mixture should have no lumps of resin in it, and the colour should be that of very strong tea. The added water should bring the quantity of concentrated spray up to 25 gallons; dilute to 100 gallons or 1 to 3 of water, and to obtain the best results spray when warm (not hot). Resin should be well powdered before adding to the boiling mixture.

Pests affecting the roots of plants are more difficult to control. These include nematodes, worms, woolly aphis on apple roots, etc. Soil fumigants are best for treating this class of pest; tobacco dust is good if worked into the soil round the trees. Vaporite is also used for this purpose; the latter is usually stocked by wholesale chemists.

General precautions must be taken against pests and diseases. Collect all visibly affected fruits and destroy them. Never leave fallen fruit on the ground for any length of time. Boil or bury them very deeply. Such measures have a marked and beneficial influence on the control of all pests. Hand collecting of some of the insect pests is necessary if they are to be checked or destroyed.

## SUMMARY.

1. The best orchard soil is a light to medium light loam with good depth and drainage.

2. All orchards should be sheltered either naturally or artificially from the hot and dry winds experienced during the Rhodesian spring.

3. The best aspect for the orchard is a gentle southern and eastern slope.

4. Preference should be given to a site capable of being irrigated.

5. The site should be near the homestead.

6. The land should be well prepared and graded before planting.

7. All holes should be dug two feet square and should then be filled with good surface soil.

8. Trees should be planted at the correct spacing, if necessary so arranged that short lived trees may at a later date be taken out to furnish more growing room for longer lived larger trees.

9. Trees should be ordered well in advance of the planting season; this ensures securing the desired varieties.

10. Deciduous trees must be planted in June and July, citrus and evergreen trees generally early in the rainy season.

11. Buy first size healthy trees from an established nurseryman.

12. Choose varieties suitable for the zone you wish to plant them in. Cherries will not grow at Mazoe, nor will pawpaws grow at Inyanga.

13. If trees are dry and shrivelled on receipt, treat them as directed.

14. Plant trees no deeper than they stood in the nursery; deep planting is fatal to most trees.

15. Certain varieties must be planted side by side for inter-pollination purposes. Bordeaux wash, or affix wooden slats on the western side of the stems of young trees; this prevents sun-scald.

16. Pruning is essential with most deciduous fruit trees. In order to regulate the crops the owner must understand the fruit-bearing habits of the trees to be pruned. Vigorous trees require light pruning and weak trees heavy pruning.

17. Winter pruning should be performed when the trees have shed their leaves. Summer pruning is done during the growing season.

18. All deciduous trees should be shaped like a goblet or wine glass. This allows air and light to penetrate to the inner branches. In Rhodesia the trees must not, however, be kept too open in the centre.

19. All dead, weak and diseased wood must be cut out; also branches that cross or crowd each other.

20. All unprofitable trees should be replaced with good varieties either by re-planting or top-working.

21. It is a mistake to allow trees to fruit too young; this causes dwarfing, and they are of little value in later years.

22. The fruit should be thinned out of all trees that have a tendency to over-produce; 100 good large fruits are better than 500 small ones.

23. Fruit thinning must be done soon after the fruit has set; late thinning is useless.

24. When harvesting fruit, handle it as you would eggs.

25. Use a ladder when harvesting the fruit on large trees; other methods end in broken limbs of trees or pickers.

26. Over-ripe fruit is often unpalatable; harvest all fruit at the correct stage of ripeness. Many late apples, pears and other fruits may be stored for several weeks.

27. All trees should be watered when they are in need of it; fruit crops will fail if the soil is dry when the trees are in blossom. When possible, irrigate all fruit trees before they blossom, and citrus trees again when in full flower.

28. Fruit trees are incapable of producing annual crops of good fruit without being fed. They should be fertilised and manured from the time they commence to bear. Large trees require more feeding than small ones.

29. Early autumn is a good time to feed trees, as the food may then be ploughed under with a green crop.

30. Sunn hemp is the best green crop to grow between the trees, for ploughing it under furnishes a large amount of humus-forming material, which is particularly valuable if farmyard manure is not available.

31. Good cultivation is essential for successful fruit growing. Plough the ground in autumn, loosen the soil under the trees and harrow occasionally to produce a good tilth and conserve the soil moisture.

32. Cultivation enables the roots to receive sufficient air, which is so necessary for their healthy development.

33. Inter-planting of young orchards may be practised. Tall growing crops are unsuitable, since they exclude air

and light from the young trees. Do not inter-plant large trees; they require all the air, space and plant food available.

34. Spray in winter with lime sulphur; this prevents disease and destroys pests.

35. Leaf and fruit chewing insects may be killed by spraying their food supplies with poison.

36. Sucking insects are destroyed by poison baits or a caustic contact spray.

37. Most spray mixtures and poisonous things should be kept under lock and key, and be handled with great care.

38. The Government Horticulturist is employed by the State to give advice on fruit culture. Make use of him.

# What is Diplodia in Maize?

## AN ANSWER TO A POPULAR QUESTION TO-DAY.

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Diplodia or dry rot of maize is a common disease in most maize-growing countries of the world, and is widely distributed throughout Rhodesia and the Union. It has been known to exist in this Colony for a considerable number of years, but few farmers have identified the name Diplodia with the mouldy growth which is found every year on a certain percentage of cobs. Such, however, is Diplodia, and it behoves every maize grower to acquaint himself with the following facts about the disease.

Dry rot of maize is brought about by the action of a fungus called *Diplodia zeæ* in feeding upon and thus destroying the reserve food material in the kernels. Affected cobs vary in the symptoms which they show, according to the severity of attack and degree of penetration of the fungus. On a heavily infected cob the kernels are usually of a medium brown colour with a pink tinge on the sides, light in weight, much shrivelled and but loosely attached, whilst between the rows, and often over the whole surface, is a white, compact, cottony growth of the fungus. Fig. I. illustrates the appearance of such a cob, and Fig. II. shows the base of the sheaths from which it has been removed; in such a severe case of infection the diseased cob can be plainly discerned in the field by the appearance of the husks. At the base and along the covering of the shank a considerable development of the white fungus usually takes place, whilst higher up may be seen areas covered with a sooty deposit. Sometimes, as shown in

Fig. II., minute black bodies may be seen dotted over the sheaths, being particularly noticeable where they protrude through the white fungus mat. These dark bodies are the fruits of the fungus and are filled with an enormous number of microscopically small spores, each of which is comparable to a seed of an ordinary flowering plant. The sooty deposit seen in the illustration is a mass of these spores, which have been liberated from the fruits (or pycnidia). Only a small percentage of the total number of liberated spores is still attached to the sheath, the remainder having been dispersed by the elements to bring about new infection on neighbouring plants or possibly lands. Unfortunately it is not always possible easily to detect Diplodia-infected cobs, even after they have been reaped, but observations go to show that there are certain symptoms which in the majority of cases are indications of the presence of the parasite. If we consider its life history we shall see how these develop.

Original infection of the cob may be traced in most cases to spores liberated from maize trash left from the previous season. Depending on the age of the plant, the fungus may gain entrance to the cob by different ways. Imagine a maize plant about five feet high just before the young cob pushes its way out of the leaf sheath. At this time of year rains are general and the atmosphere is humid, so that if a leaf is stripped from the main stalk an accumulation of moisture will be observed between the closely-fitting leaf sheath and the latter. It will also be noticed that some of the old pollen sacs have dropped from ripe tassels and are adhering to the leaf at the point where it leaves the stalk. A closer examination will usually show small white tufts of a fungus growing upon this damp collection of old pollen, which makes an ideal medium to stimulate germination and subsequent growth of spores alighting upon it. Should some of the spores happen to be those of Diplodia the fungus will not be content to remain upon the decaying rubbish, but will attack the leaf sheath and continue to grow in the living tissue of the plant. From the leaf sheath it will spread to the stalk, which it is capable of infecting, and a brown discoloration just beneath the rind, particularly noticeable at the joints when the stalk is split, is one of the conditions produced by the attack of this organism. The leaf sheath itself also shows discoloration usually as a light

brown, more or less circular area surrounded by a distinct purple or reddish margin, and is only distinguishable from similar lesions due to stalk borer by the absence of a hole in the leaf and stem. This patch on the leaf sheath is not an infallible indication of the presence of Diplodia, since certain other fungi may cause identical symptoms, but in the majority of instances examined by the writer, Diplodia has been present. At a later stage in the growth of the plant the presence of the parasite is more easily detected, and although penetration may not have advanced as far as the cob, the white fungus web can be traced through several of the surrounding husks. Often the shank is attacked and a brown discoloration appears, which, as time goes on, extends to the cob. The silks also provide a ready means of entrance for the fungus, resulting in the well-known mouldy tip to the cob. At this stage infected plants may be distinguished by the prematurely ripe appearance of the husks contrasting with the green colour of their neighbours, but owing to the general uneven ripening of a field of maize this single symptom must be supplemented by others already mentioned. However, where infection has occurred early in the season and development of the fungus has been rapid, it is often possible to find cobs with all symptoms of Diplodia, including the minute fruit bodies called pycnidia imbedded in dried-out husks, whilst a large proportion of the crop is still green. The final development of the disease has already been described on the cob, but attention must also be directed to the stalk, where lies a serious source of danger for the coming season.

With reference to the spread of Diplodia from the leaf sheath to the stalk, it was mentioned that a brown discoloration appeared beneath the rind, and was particularly noticeable at the joints when the stalk is cut. This discoloration is due to the destructive activity of the fungus, and as the stalk matures the symptoms become more marked. At a later stage, when the sap stream in the plant is stopped and the food supply of the fungus is withheld, the latter goes into a resting condition and produces large numbers of fruits which may often be seen crowded together at the joints of the stalk. In this condition the fungus is able to withstand drought and cold and so tides over the winter

months to begin its life cycle again in the spring by the liberation of spores (or "seeds") from the minute fruits.

**How Diplodia Affects your Crop.**—Having sketched briefly the life history of the fungus, it is now necessary to give consideration to the practical points which directly affect the farmer. We have seen that Diplodia causes a certain amount of direct loss by destroying a proportion of the cobs, which, if heavily infected, are not only useless, but are a source of danger to cattle, it having been shown that the death of a beast may result from feeding upon mouldy cobs which have been left in the lands. A warning to this effect was published recently in "Farming in South Africa" (1) by the Union Veterinary Department. From experience gained in Rhodesia it is also thought that pigs and poultry may be adversely affected by a diet of discoloured grain. All fully-diseased cobs may therefore be written off as a complete loss. Now all cobs are not completely invaded by the fungus and often it is extremely difficult to detect infection. The fungus may have penetrated the centre of the cob late in the season, but may not have advanced sufficiently far to be visible when reaped. It frequently happens that only the tips of the kernels are attacked by the fungus, which, however, may establish itself in the grain and remain dormant as long as the grain is kept dry. Other kernels may have become infected by way of the silks, whilst Diplodia spores are certain to be present in any sample of maize which is reaped and shelled under existing conditions. It is obvious, therefore, that seed affected in any of these ways is likely to carry the disease to the succeeding crop, and, in fact, it is well known that dry rot is a seed-borne disease. Now, what is the effect of the presence of Diplodia in your seed? Firstly, there will be a reduction in stand due to the non-germination of badly infected kernels. Secondly, a certain number of plants will grow from infected seed, but will be lacking in stamina and soon become crowded out by their more vigorous neighbours. Most of these plants will produce no crop, or at best a small cob, light in weight and of little value. It has been suggested that Diplodia may also gain entrance to the cob from infected seed by way of the roots, but there seems to be little evidence in favour of this theory. It may therefore be stated that there are three principal sources of loss to your maize crop due

Fig. I. Typical heavy infection by Diplodia.

Fig. II. Sheath of cob shown in Fig. I. Note white mouldy growth at base, dotted with the back spore cases of the fungus. The black sooty deposit of Diplodia spores is also seen.

Fig. III. Cob infected by the Fusarium fungus. The mouldy growth at the tip is rose pink in colour.

to the presence of Diplodia: (i.) Total loss of infected grain; (ii.) reduced stand; (iii.) reduced yield from weak plants. Now how can these losses be expressed in figures? We have very little local information to assist in an estimation of losses in Rhodesia, but Mr. T. J. Mossop, of Glendale, recently published in the *Rhodesia Herald* (2) some interesting records from his experiment plots. He found from a number of counts that the percentage of visibly infected plants in a given area could be as high as 36 per cent., and further information obtained from other well-established maize growers, together with observations made by the writer, suggest that this is not an exceptional figure. With regard to reduced stand, reference can be made to work in America carried out by Durrell (3) and published in 1923. He shows that a reduction in stand of as much as 25 per cent. is not uncommon when seed containing a high percentage of Diplodia kernels is used. The following table is quoted as being illuminating:—

*Yield* versus *Germination and Stand.*

| | Per cent. germination. | Total yield in lbs. | Per cent. stand. |
|---|---|---|---|
| Fifty-seven rows of Diplodia-free seed ... ... ... ... ... | 100 | 1,714 | 90 |
| Fifty-seven rows of Diplodia-infected seed ... ... ... ... ... | 75 | 1,272 | 64 |

The figures represent data from 4,564 hills, planted three kernels to a hill, and the author states:—

"In six localities over the State (of Iowa) similar plot comparisons show like results for Diplodia-infected seed.

"The bulk of this loss is no doubt due to lowered stand . . . but . . . the results of planting seed from dry-rot-infected ears indicate that the fungus not only kills a certain percentage of the seed, as evidenced by lowered stand, but also the plants that do grow show weakening. . . . They are more spindly and yellowish as well."

It was apparently not possible for the author to express the loss resulting from weak plants in figures, but that the loss was appreciable can be well understood if a comparison is made with the average Rhodesian maize crop. A further experiment in a germinator illustrates the reduction in

stand which may be brought about by varying proportions of infected kernels in a sample of seed.

| Per cent. of Diplodia infected kernels on germination. | Resulting stand. |
|---|---|
| 0 | 98 per cent. |
| 12 | 86 ,, |
| 25 | 80 ,, |
| 37 | 76 ,, |
| 50 | 45 ,, |

We find, therefore, that where no control measures are practised and where care is not taken to eliminate infected kernels from seed maize it cannot be considered an extravagant estimate if we say that there is a 15-20 per cent. average annual loss to the maize crop from Diplodia alone.

**Conditions Favouring Diplodia.**—There seems to be little doubt that the disease, if not more prevalent, is more virulent in wet seasons. The fungus will not thrive under dry conditions, but will grow very rapidly in a damp environment. It also requires air for its development, but can maintain itself for a considerable period on material other than maize cobs or stalks. The temperature which favours rapid fungus growth is very close to the optimum temperature for the growth of maize, so that under good growing conditions we may expect a high proportion of badly rotted cobs and blanks in the field. Particularly will the fungus develop after reaping. When late rains occur, difficulty is experienced in drying out the cobs, which are often stooked or stacked in large heaps, whilst they still contain a relatively high proportion of moisture. That Diplodia spreads with extreme rapidity in the stooks and heaps is well known to the observant maize grower. Predisposing conditions for initial infection of cobs in the lands will include suitable temperatures and humidity and also the proximity of old maize trash containing Diplodia fruits, for it has been shown on a number of occasions that there is no correlation between the degree of infection of seed and the subsequent amount of dry rot in resulting cobs. Now that the chief points about Diplodia have been discussed, it is possible to put forward some suggestions for control of the disease.

**Control.**—Measures to be adopted for control of dry rot divide themselves into three classes: (i.) Seed selection; (ii.) Seed disinfection; (iii.) Farm routine methods.

In selecting seed every care should be taken to see that the cob is perfectly free from discoloration of any kind. The husks should also be examined in order to ascertain whether the plant has been attacked. A cob having the most perfect show points imaginable should always be discarded if there is any suspicion of the presence of disease. It is natural for a farmer on finding a really excellent specimen of a seed cob with a slight discoloration of the tip or butt to say to himself, "I cannot discard this cob for the sake of a few brown kernels at the butt, because these will be cut off anyway before making a final selection," but he forgets that this discoloration is probably due to Diplodia and that a high proportion of the kernels may be infected, although not visibly so. It would be as well to bear in mind that a few brown kernels may mean a loss of a hundred pounds or more sterling, which would pay twenty-five boys for four months to clear the witch weed out of your lands, and give you a few more bags to the acre, which would allow you to plant a bigger acreage next year—and so on. Those few brown kernels play an important part in the life of the maize grower. Then, in selecting your cobs for seed, suitable plants should be marked when green and the cob should never be allowed to dry out on the stalk, since it is open to infection all the while. As soon as possible, well dented seed cobs should be thoroughly examined for disease and reaped and stored in some manner so that they will dry out rapidly. A full discussion of methods of storing is not appropriate at the moment because of the diversity of routine methods adopted in this Colony, but it must be emphasised that the rapid drying of seed and isolation from the main crop are of extreme importance if Diplodia is to be reduced to negligible proportions. With regard to the main crop, the farmer will realise that there are many difficulties to be overcome in order to prevent the spread of disease whilst cobs are drying out. The matter is being investigated at the moment in relation to the various methods of reaping adopted in the Colony, but no cut and dried plan has yet been evolved to meet all conditions. Similarly, the question of seed disinfection is under consideration, and it is expected that recommendations will be made in the near future. Certain chemicals have been shown to reduce losses from Diplodia

to a very small figure, and there seems to be no doubt that seed treatment for maize (as with other cereals) will have to be established on every farm before long.

The most serious source of infection for the growing cob lies in the fungus fruits which are harboured in old maize trash. The lower joints of the stalks of a relatively high percentage of plants in a field are likely to be infected, and to burn this trash would be a simple method of checking the disease, but the necessity for stalk feeding of cattle is so great in Rhodesia (its value works out approximately at 12½ per cent. of the value of the beast) that some other method must be discovered. Many suggestions have been put forward to farmers, but there is always found to be some objection. It seems to the writer, however, that stooking, reaping, feeding to cattle and then burning the uneaten residue before the rains arrive, offer some hope of overcoming many objections. In conjunction with this, all infected husks, cobs and other rubbish *must* be burnt. There is no adequate excuse for keeping such trash upon a farm unless it is to satisfy one's conception of a Rhodesian farm. To throw infected rubbish into the kraal to be trampled is considered to be a dangerous practice, since it has been shown that Diplodia can grow upon such manure and the fungus is liable to be transferred to the lands by this medium. Uninfected material offers no danger to the succeeding crop; it is the infected rubbish which must be burnt, and there is no danger in transferring the ash to new lands. Rotations are also suggested as control measures, but it is not intended now to discuss this matter. If the control measures which have been put forward are brought into operation we may expect a great reduction in the amount of Diplodia within a few years.

**The Pink Fungus.**—The above notes have dealt with the true dry rot fungus, *Diplodia zeæ*, but there is also another cob rot which is common throughout the Colony. This, in all cases encountered by the writer, appears at the tip of the cob, and is characterised by the rose-pink colour of the infected portion. (Fig. III.) Its general appearance is identical with that known as heart rot or ear rot, which is caused by another fungus known by the imposing name of *Giberella saubinetii*, and although what is believed to be one

form of this fungus (*Fusarium*) has been found, the complete form has not yet been noted. On a few occasions the fruits of Diplodia have been found protruding through the pink fungus mat, but this is probably only a case of dual infection. It appears safe to assume, however, that Giberella is commonly encountered in Rhodesia. The life history of the fungus and its general behaviour are so much like those of Diplodia that control measures advocated for the latter apply equally well to the former, especially the method of seed treatment. Giberella is' said to do most of its damage by causing a seedling blight, and in the case of continual planting to maize, one might expect a land to become heavily infected. In such cases rotations are necessary.

In conclusion, it must be emphasised that Diplodia is one of the chief causes of lowered yield in Rhodesia, but that no magical methods are likely to be introduced for its eradication. Every practical measure will be tested, but there is little likelihood of pronounced success unless the farmer is prepared to help himself and wage war against one of his greatest enemies.

## SUMMARY.

1. *Diplodia zeæ* is a fungus which causes the common "mouldy cob" of maize.

2. It may attack the cob, husks, leaf sheath or stalk, and is carried over from year to year by means of fruits of the fungus which are harboured in this material.

3. The disease is also seed-borne, and causes serious reduction in stand.

4. Three methods of control involve (i.) seed selection; (ii.) seed treatment; (iii.) farm routine methods.

5. Another disease due to the "pink fungus" is also described and likened to Diplodia.

6. An appeal is made to farmers to assist wholeheartedly in a war against Diplodia.

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# Salisbury Agricultural Experiment Station.

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*(Continued.)*

By H. C. Arnold, Station Manager.

## SWEET POTATOES.

The droughtiness of the past two seasons and the increased attention which farmers are now paying to dairying and pig-raising have impelled them to give more attention to succulent crops, which provide a substitute for green fodder during the dry season. Among such crops the sweet potato is much esteemed because of its hardiness and reliability. On soils which are reasonably fertile and well drained sweet potatoes always produce a good crop if a suitable variety is grown and proper cultural methods are employed. The yield is often not as heavy as that of pumpkins and majorda melons when the season is favourable to the latter crops, but owing to climatic conditions or insect pests the pumpkin and melon crops sometimes fail, whereas the sweet potato is a certain cropper. It is sometimes attacked by hawk-moth caterpillars and the larvæ of a species of ladybird, but the damage they inflict is usually only of a temporary nature, and as soon as the visitation is past the crop continues its growth. It has been noticed here that several year old plantings are much more subject to insect attacks than those which are newly laid down, and it appears advisable to destroy old fields of potatoes after they have been down two or three years. As the stems and leaves are susceptible to low temperatures, it is usual to feed them to the live stock before

frosty weather is expected. As an alternative they may be converted into silage, but they contain too high a proportion of water to make good silage when freshly cut, and should be allowed to wilt in the field for a week or two before being ensiled. Another method is to mix maize stalks which have become too dry for silage with the fresh sweet potato tops, so that the excess of moisture in the one may balance the deficiency in the other.

Many varieties of sweet potatoes have been introduced and tested at this station during the past twelve years. Of these the Common Pink, Calabash Leaf and Early Butter have proved about equally valuable, but each is superior to the other introductions. The variety called "Linslade" is the most promising of the kinds recently received.

## SWEET POTATO VARIETY TRIALS.

*Yields in lbs. per acre.*

| Name of variety. | Average weight of tubers during six years' trials. | Average green tops. |
|---|---|---|
| Common Pink ... ... ... | 17,870 | 12,436 |
| Early Butter ... ... ... ... | 18,113 | 15,213 |
| Calabash Leaf ... ... ... | 13,776 | 17,408 |
| Red Nancemond ... ... | 12,094 | 16,091 |
| | Over 3 years | |
| Linslade ... ... ... ... ... | 16,338 | 17,763 |
| | Over 2 years | |
| Oklahoma ... ... ... ... ... | 11,344 | 18,660 |

Having once become well established on the land, "volunteer" crops of sweet potatoes will continue to appear for a number of years unless steps are taken to eradicate them. With the object of finding how the second year crop compares with that of the first year, volunteer crops have been allowed to mature for the past three seasons with very satisfactory results. Although the second crop does not equal the first either in quantity or quality, the practice appears to be profitable, because the expense of ploughing and planting each year is not incurred. On weed infested land, however, the crop may become considerably reduced unless sufficient labour is available to hand weed it.

## SWEET POTATOES: VOLUNTEER CROPS.

*Yields of Tubers in lbs. per acre.*

| Name of variety. | 1st year's crop for comparison. 1926-27. | 2nd crop. 1927-28. | 1st year's crop for comparison. 1925-26. | 2nd crop. 1926-27. | 2nd crop. 1925-26. | Average of 3 seasons' volunteers. |
|---|---|---|---|---|---|---|
| Common Pink ... | 14,040 | 11,519 | 16,524 | 4,334 | 14,166 | 10,006 |
| Early Butter ... | 16,623 | 14,365 | 14,160 | 3,850 | 16,488 | 11,569 |
| Calabash Leaf ... | 10,269 | 9,180 | 11,640 | 3,410 | 4,392 | 5,660 |
| Red Nancemond ... | 12,789 | 9,945 | 11,664 | 3,454 | 6,225 | 6,542 |
| Linslade ... | 12,440 | 14,076 | 16,215 | 3,542 | ... | ... |
| Average of all vars.... | 13,232 | 11,817 | 14,040 | 3,718 | ... | ... |

This tabulation shows that the yields of the second crop usually compare favourably with those of the first crop, though for some obscure reason the yield in 1926-27 was much lower than that of the other two seasons. It is probable that the favourable climatic conditions of season 1925-26 induced the production of a heavy crop, which left the land somewhat impoverished of the plant foods required. Thus on soil depleted of nutriments, and with a rainfall considerably below normal, the second crop proved a comparative failure.

## LINSEED OR FLAX.

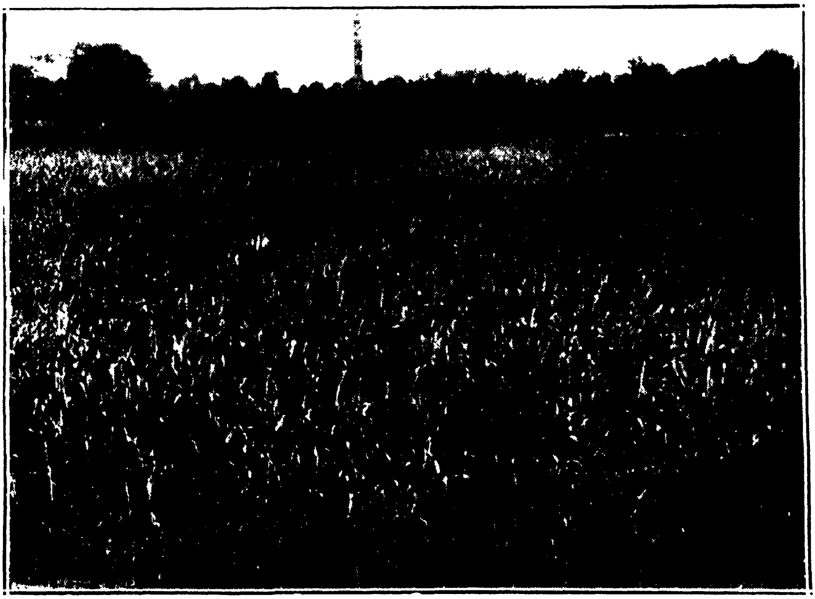
This crop is well known as both a fibre and seed crop, but in this Colony it is at present grown only for its seed. When the crop is intended for fibre, the seed should be carefully broadcasted at the rate of 75 lbs. to 100 lbs. per acre and harrowed in. Seeded in this way a thick stand is secured, and the plants have long single stems with no branches; therefore they are more suitable for fibre than branched stems, which result from thin stands. When seed production is the objective, less seed should be sown. If the seed bed is thoroughly prepared, 15 lbs. to 20 lbs. per acre will be sufficient of the small seeded varieties, but 25 lbs. to 30 lbs. will be required if the large seeded variety is being grown.

**Variety Trials.**—Several varieties of linseed have been under trial here for a number of years. The "white flowering" kind has consistently given good results when grown for seed

Cannas and sweet potatoes planted in alternate rows to investigate their relative merits as producers of succulent feed. Agricultural Experiment Station, Salisbury.

Soya and Boer manna grown together for hay. The upright habit of these crops allows of their being handled by hay-making machinery. Agricultural Experiment Station, Salisbury.

The White Jack bean. A drought-resistant crop suitable for green manure and autumn stock feed. Agricultural Experiment Station, Salisbury.



Kenya Governor wheat. A summer-grown crop. One of the best wheats for either summer or winter cultivation in Southern Rhodesia. Agricultural Experiment Station, Salisbury.

purposes. Recent introductions such as Saginaw, Pskoff and J.W.S. may prove themselves more suitable for flax production.

## LINSEED VARIETY TRIALS.

*Yields in lbs. per acre.*

| | 1927-28. | | 1926-27. | | Average over 4 seasons. | |
|---|---|---|---|---|---|---|
| Name of variety. | Straw. | Seed. | Straw. | Seed. | Straw. | Seed. |
| Large-seeded ... | 560 | 304 | 1,440 | 180 | 956 | 305 |
| White-flowering .. | 850 | 296 | 1,656 | 304 | 1,079 | 348 |
| Small-seeded .. | 640 | 260 | 1,845 | 261 | 855 | 361 |
| Yellow-seeded ... | 800 | 272 | 1,692 | 270 | 1,018 | 352 |
| Saginaw ... | 1,080 | 240 | 1,755 | ... | 1,445 | ... |
| Pskoff .. | 1,050 | 200 | 1,596 | ... | 1,378 | ... |
| J.W.S. ... | 1,900 | 150 | 1,846 | ... | ... | ... |

## BEAN VARIETY TRIALS.

**Dolichos** (Bonavist or Hyacinth Bean).—This crop has rapidly gained in favour among Rhodesian farmers during the past few years owing to its ability to produce heavy crops of fodder over a wide range of soils and under unfavourable climatic conditions. Its chief uses are for hay, silage or green manure. Its seeds are also used to a limited extent for stock feed and for human consumption.

Variety trials with this bean have been conducted for many years, and through the courtesy of the United States Department of Agriculture, about fifteen new varieties were received five years ago. These have been thoroughly tested, but none of the new kinds in any way surpasses the older ones, and their further cultivation is being discontinued. Although the vegetative growth of the varieties in these trials, during the season under review, was equal to that of previous seasons, except the small brown-seeded kind, the yield of seed was remarkably lower than usual. The reason for this is obscure, but it is thought that the erratic distribution of the rainfall induced the plants to produce secondary vegetative growth at the expense of seed.

In these trials the white-seeded varieties have yielded a larger amount of fodder than the common brown-seeded

variety, but the seed production of the latter has been larger and more consistent than of the former, while its yields of fodder are almost as heavy. For these reasons the small brown-seeded variety will probably be found to be the more profitable one to cultivate in districts where climatic conditions are similar to those of this station, but in warmer localities, or where the crop is to be grown under irrigation, the white-seeded varieties may prove better.

## DOLICHOS BEAN VARIETY TRIALS.

*Yields in lbs. per acre.*

| Name of variety. | Green Fodder. 1927-28 | Green Fodder. Average 1924-28. | Hay. 1927-28 | Hay. Average 1924-28. | Seed. 1927-28 | Seed. Average 1924-28. |
|---|---|---|---|---|---|---|
| Indian ... | 16,200 | 16,939 | 4,080 | 5,182 | 60 | 241 |
| Ewanrigg ... | 19,340 | 20,760 | 4,290 | 5,671 | 30 | 133 |
| A.E.S. White-seeded ... | 16,140 | 19,402 | 4,080 | 5,321 | 38 | 150 |
| Small Brown-seeded ... | 24,000 | 17,595 | 4,560 | 4,786 | 360 | 388 |
| Large Brown-seeded ... | 19,080 | 9,980 | 4,680 | 2,717 | nil | 126 |
| New Introductions. (3 years) | | Average over 3 years. | | Average over 3 years. | | Average over 3 years. |
| 137/24 ... | 23,040 | 16,420 | 5,640 | 3,880 | 15 | 132 |
| 138/24 ... | 8,160 | 11,260 | 1,680 | 3,360 | nil | 140 |
| 139/24 ... | 19,800 | 17,440 | 3,960 | 4,340 | 2 | 45 |
| 144/24 ... | 20,880 | 14,620 | 4,680 | 3,980 | 8 | 135 |
| (2 years) | | Over 2 years. | | Over 2 years. | | Over 2 years. |
| 145/26 ... | 12,840 | 12,510 | 2,520 | 2,940 | 15 | 15 |
| Mac's Bean ... | 16,440 | 16,020 | 3,840 | 3,800 | 8 | 8 |

**Velvet Beans.**—This leguminous crop is now well known and is generally recognised as being one of the best green-manuring crops for Rhodesian conditions. It is easy to cultivate, because from its seedling stages until it reaches maturity it is extremely resistant to drought and is comparatively free from attack by insect pests. In wet seasons it suffers from a fungoid disease which attacks the leaves, causing them to fall prematurely. During the past seven years

some fourteen varieties have been tested. Of these, the White Stingless has consistently given heavier yields of fodder than the other kinds, and is considered to be the most suitable variety for hay, silage or green manure. On the other hand, the yields of seed of Osceola and Tracey's Early Black are very much heavier than those of the others, and farmers who require a variety the seed of which is to be used as stock feed are advised to give these a trial. The heavy seeding varieties are not as suitable for converting into hay as the other kinds, because of their numerous seed pods, which are slow to cure, and the relatively small amount of vines and leaves.

## VELVET BEAN VARIETY TRIALS.

*Yields in lbs. per acre.*

| Name of variety. | Yields of Hay. 1927-28. | Yields of Hay. 1926-27. | Average for 5 seasons. | Yields of Seed. 1927-28. | Yields of Seed. 1926-27. | Average for 6 seasons. |
|---|---|---|---|---|---|---|
| White Stingless | 3,300 | 6,160 | 3,595 | 1,200 | 1,560 | 730 |
| Fungwe ... | 3,360 | 6,300 | 3,624 | 720 | 1,320 | 560 |
| Mtoko ... | 2,880 | 5,640 | 3,554 | 480 | 960 | 385 |
| Urungwe ... | 3,360 | 5,800 | 3,279 | 720 | 1,360 | 675 |
| Stigolobium taborense ... | ... | 4,620 | 2,713 | ... | 1,200 | 586 |
| Florida ... | 4,200 | 5,160 | 3,334 | 600 | 2,040 | 827 |
| Bush ... | 1,680 | 3,240 | 1,898 | 640 | 1,120 | 502 |
| | | | Over 4 years. | | | Over 4 years. |
| Chinese ... | ... | 5,400 | 3,256 | ... | 960 | 561 |
| Georgia ... | 7,560 | 6,420 | 4,886 | 2,240 | 1,950 | 1,104 |
| Osceola ... | 5,640 | 7,440 | 4,445 | 2,500 | 2,212 | 2,052 |
| Tracey's Early Black ... | 6,600 | 5,580 | 4,605 | 2,960 | 2,760 | 2,001 |

**Soya Beans.**—In the maize areas of America the acreage under this crop has increased enormously during the last decade. This fact suggests that it might be a useful crop for the maize areas of Rhodesia. Many years ago a number of varieties were tested at this station, but the results were disappointing. About three years back several kinds were obtained, and trials with these have given more encouraging results, though on the poorer types of soil the yields are still low.

The chief value of this crop in this Colony would be in the excellent fodder which it yields. This, when converted into hay or silage, provides a roughage equal to and possibly better than that of any of the other annual legumes at present grown as summer hay crops. It has an advantage over dolichos, velvet beans, etc., by reason of its upright habit of growth, which allows it to be handled rapidly and economically by means of hay-making machinery. Surplus seed could be used on the farm as stock feed, or, as an alternative, sold for the extraction of oil, of which it contains some 15 per cent. to 20 per cent., while the residue of the seed provides an excellent concentrate for feeding to live stock.

In the trials conducted at this station the Soya bean crop has responded in a remarkable manner to dressings of farmyard manure. Whether this is entirely due to the plant food contained in the manure, or whether the humus supplied by such dressings by providing a more suitable medium for the development and multiplication of nitrogen-gathering bacteria causes the increased crop, has not been definitely ascertained. It has been noted that numerous nodules appear in the roots of Soya bean plants when they are grown on manured land, and that few are formed when the crop is grown on land which lacks an ample supply of humus, particularly when it is carrying this crop for the first time.

Of the varieties introduced and tested here, that known as Otootan has given the best results. It is slower in reaching maturity than the others, which characteristic probably accounts for its heavier yields. This variety has produced as much as eight tons of green fodder and 1,200 lbs. of seed per acre when grown under favourable conditions. Through the courtesy of Mr. Kapnek, of Frogmore, Glendale, three new varieties have been received, namely, Herman, Chiquita and Dixie, but owing to their late arrival and the scarcity of rain, their yields were probably not as heavy as they would have been under more favourable conditions.

## SOYA BEAN VARIETY TRIALS.

*Yields in lbs. per acre.*

| Name of variety. | 1927-28. Hay. | Seed. | 1926-27. Hay. | Seed. | Average 2 seasons. Hay. | 4 seasons. Seed. |
|---|---|---|---|---|---|---|
| Ototan ... | 2,080 | 680 | 1,600 | 960 | 1,840 | 752 |
| Haberlandt | 1,640 | 620 | 1,360 | 840 | 1,500 | 580 |
| Columbia ... | 1,160 | 400 | 1,154 | 738 | 1,157 | 489 |
| Biloxi ... | 3,160 | 160 | 1,280 | 496 | 2,220 | 345 |
| Herman ... | 1,526 | 574 | ... | ... | ... | ... |
| Chiquita ... | 1,088 | 254 | ... | ... | ... | ... |
| Dixie ... | 1,022 | 224 | ... | ... | ... | ... |

**White Jack Bean:** *Canavallia* sp.—Seed of this annual bean crop was received some ten years ago under the name of "Gotani" bean. Early experiments conducted with it did not reveal any special merit. Although it grew well, it appeared not to possess any value above that possessed by the better known velvet and dolichos beans, and its cultivation was about to be discontinued when its remarkable drought-resistant powers were noted. During seasons in which frosts are not severe it remains green and succulent until August, which is long after all other annual legumes have dried up. It is thought, therefore, that in comparatively frost-free areas it may provide valuable autumn and winter fodder, with a high protein content, suitable for feeding to cattle and other farm stock in a fresh, green state. Yields of eight to ten tons per acre have been obtained at this station. Its ability to continue its growth long after the seasonal rains have ceased suggests that it might be sown under maize at the final cultivation of that crop for ploughing in as green manure after the maize crop had been reaped. (Experiments in which it was made use of in this way have been reported on above.) The plant is susceptible to severe frost, but in districts where only light frosts occur its cultivation and utilisation as green manure or green fodder present no difficulty. In common with the dolichos bean, the crop is sometimes attacked by Ootheca beetles, but no other serious damage by either insect pests or fungoid diseases has been noticed. Its upright habit of growth allows it to be conveniently ploughed under, and the yields of maize following its use as green manure indicate that for that

purpose it is equal to the better known green manure crops. In frost-free districts, during seasons of low rainfall, as much as eight bags an acre of seed have been reported; but in seasons of heavy rainfall, though the vegetative growth is luxuriant, lighter yields of seed are often as low as one or two bags per acre.

## EDIBLE CANNA.

This plant is a comparatively new introduction, and therefore must be regarded as an experimental crop for some time to come. It promises to be a prolific producer of succulent feed, which, without preservation in any way, will be available as food for live stock throughout the year. Although its growth is more rapid during the summer months, when the temperature is high and the rainfall plentiful, it continues to grow, though slowly, in the winter months. On dry land in the springtime its rate of growth is limited only by the amount of moisture in the soil. On irrigated land the crop can be relied on to furnish green, succulent tops all the year round, except perhaps in districts which experience severe frosts; but even in such places the tubers are available for use during the winter, as they are not injured by the comparatively light frosts which occur in this Colony. The crop does not thrive very well on poor soils or on those which are water-logged. It prefers rich, deep, loamy, moist soil and semi-tropical temperatures. Given suitable conditions, it produces exceptionally heavy crops, as much as twenty tons of tubers per acre having been reported. The first tubers to reach this Colony were received in 1922, from Honolulu, and a year later a few were imported from Queensland. The two parcels together contained less than twenty tubers. The prolificacy of the crop can be gauged from the fact that, in addition to a quantity used here in feeding trials, the progeny of the original tubers has been distributed to upwards of one hundred and fifty farmers in this Colony during the past four years, so that now in the aggregate there are probably about one hundred acres of land under this crop.

The canna may be used for the same purposes as the sweet potato, but whether or not it is superior to that crop remains to be proved. There are a number of points in favour of the canna, the chief being:—

(1) Its tubers can be kept in good condition for several weeks after lifting from the ground.

(2) They can be planted at any convenient time during the rainy season, and even when planting in dry soil in September or October, a large percentage remain dormant and unharmed until favourable weather arrives for them to start to make new growth.

(3) The tubers belonging to each plant are concentrated in a mass near the surface of the soil and are easily lifted. It therefore is not difficult to clear the land when a change of crop becomes necessary.

Compared with the sweet potato, the canna has one serious disadvantage, in that it cannot be propagated from cuttings. This necessitates the reservation for seed of a part of the crop of tubers which could otherwise be used for winter stock feed. Approximately one ton of tubers is required to plant an acre of land, so that a rather high percentage of the one crop is required for planting the next crop if it is treated as an annual. This raises the question as to whether it may not be more economical to allow the crop to remain down for two or more seasons. If it is proposed to leave the crop in the ground for more than one season, the best time to transplant the tubers will be during the summer months after the ground has become well saturated with moisture, but early enough to allow the crop to obtain a firm hold before the winter drought commences. Given favourable weather conditions, nearly all the transplanted tubers will survive if reasonable care is taken to use only those which are sufficiently mature but not too old. The best are those which have attained their normal development and are bearing one or more healthy undamaged buds; but when the weather conditions are favourable to quick growth, smaller and partially developed tubers may be used as well. When it is desired to plant the crop in dry land some time before the advent of the rainy season, the tubers used for "seed" must be carefully selected, and only those which are fully developed and bearing one or more buds should be planted. The remainder of the crop may be fed to stock.

Experiments with this crop are being continued with a view to investigating the following points:—

(a) The best distance apart for planting the "seed" tubers.

(b) Whether it is likely to be more profitable to lift the crop of tubers every year or to allow them to remain in the ground for two years.

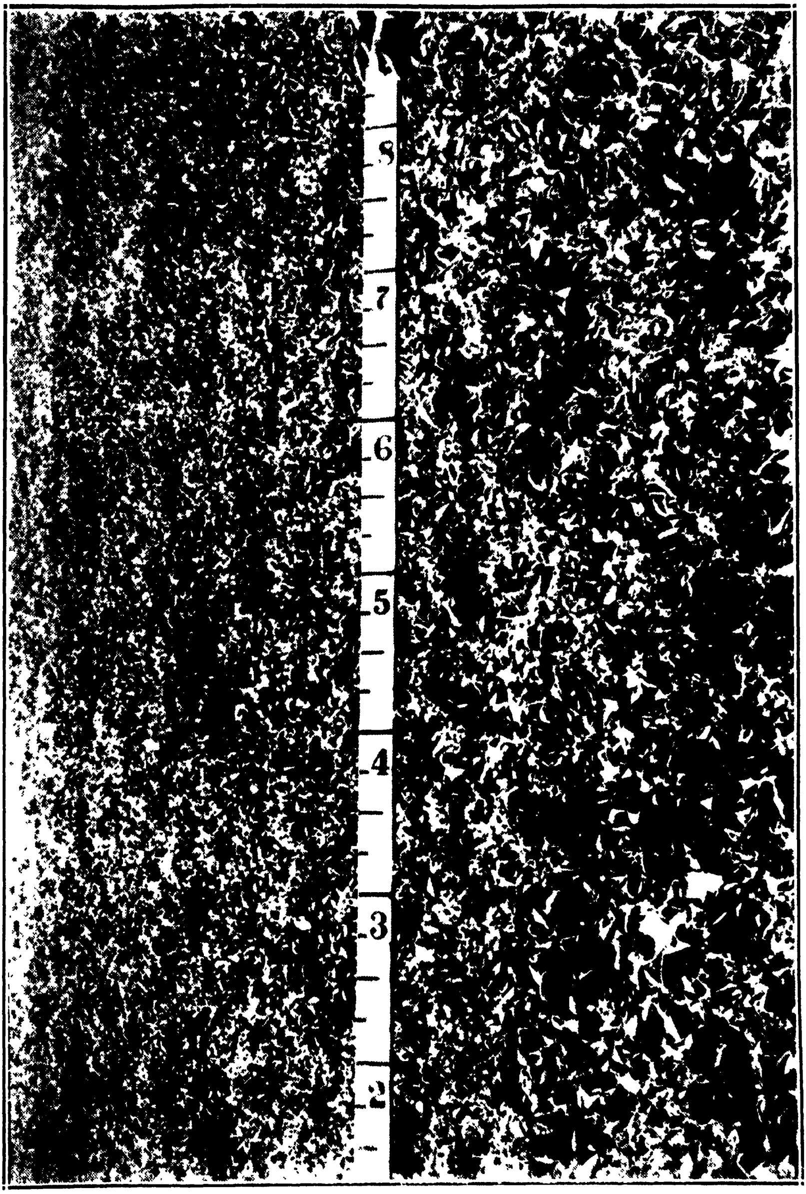
(c) Its value as a producer of succulent food for use during the dry season as compared with the sweet potato crop.

## CANNA: DISTANCE-PLANTING TRIALS.

*Yields in lbs. per acre.*

| Distance of planting. | No. of roots per acre. | Yield of green tops, season 1926-27. First cutting, May 3, 1927. | Yield of green tops, season 1926-27. Second cutting, Sept. 9, 1927. | 1927-28. One cutting, July 18, 1928. | Yield of tubers lifted. August, 1927. | Yield of tubers lifted. August, 1928. | Average green tops, 2 seasons. | Average tubers, 2 seasons. |
|---|---|---|---|---|---|---|---|---|
| 40" x 24" | 6,534 | 16,500 | 3,784 | 11,832 | 11,160 | 15,840 | 16,058 | 13,500 |
| 40" x 36" | 4,356 | 18,274 | 6,000 | 13,335 | 11,472 | 13,780 | 18,804 | 12,626 |
| 40" x 48" | 3,267 | 16,008 | 9,024 | 17,544 | 9,648 | 13,488 | 21,288 | 12,566 |

Having been conducted over two seasons only, the results of these trials cannot be regarded as conclusive, but they indicate that even though a slightly larger yield of tubers may be obtained by planting the "seed" at 24 ins. apart in the rows, it is less profitable to plant as closely as this, because it requires 1,000 lbs. to 2,000 lbs. per acre more seed than when the wider spacing of 48 ins. is adopted. Further, wider spacing encourages more robust top growth, particularly during the rainless spring months, at which time fresh green material is scarce and therefore especially valuable. The best distance for planting appears, therefore, to be between 36 ins. x 36 ins. and 48 ins. x 48 ins. With the object of finding whether it is likely to be more profitable to treat the canna as an annual by lifting the crop of tubers at the end of each season, or whether it will be better to allow its roots to remain in the ground undisturbed until the end of the second season, one half of each of the plots allotted to the distance-planting trials in the



Brown Horse Gram, a recently introduced pulse crop, whose trailing stems cover the surface of the soil with a dense mat of herbage. This suggests that it might be used to smother witch weed and other weeds. Agricultural Experiment Station, Salisbury.

Tussock grass, employed for the eradication of Mexican marigold. Dwarfed marigold, which could not attain a height of more than three inches before flowering, is here shown growing between clumps of tussock grass (*Seteria lindenbergiana*). Agricultural Experiment Station, Salisbury.

Tussock grass. Before this grass was planted the land was over-run with Mexican marigold. Agricultural Experiment Station, Salisbury.

*Oat Selections*, S.E.S. A robust oat suitable for summer cultivation. Agricultural Experiment Station, Salisbury.

Kinvarra oats in foreground, killed by rust. Kherson oat selections in background, although attacked by rust on the leaves, had rust-resistant stems and yielded a good crop of seed. Agricultural Experiment Station, Salisbury.

season 1926-27 were allowed to continue their growth, the tops alone being reaped in 1927. By method No. 1 the half from which the tubers were lifted in 1927 was replanted, and by method No. 2 the whole crop was lifted during August, 1928. The results following the two methods of treatment are shown in the following tabulation. The weight of the seed tubers (column 2) required to plant the plots in method No. 2 in the second season has been deducted from the total weight of tubers given in the sixth column. For the purpose of this calculation the "seed" tubers are assumed to weigh ½ lb. each, as the mature pieces, recommended above for "seed" purposes, usually weigh from 6 ozs. to 12 ozs. each.

*Yields in lbs. per acre.*

| | | Method No. 1. One crop of tubers in two seasons. | | Method No. 2. Tubers lifted each year. | |
|---|---|---|---|---|---|
| Distance of planting. | Seed per acre, lbs. | Tops (total of three cuttings). | Tubers, one crop. | Tops (total of three cuttings). | Tubers, two crops. |
| 40 ins. × 24 ins. | 3,267 | 32,588 | 22,200 | 32,116 | 23,723 |
| 40 ins. × 36 ins. | 2,178 | 41,248 | 23,476 | 37,611 | 22,830 |
| 40 ins. × 48 ins. | 1,634 | 44,424 | 22,128 | 42,576 | 21,502 |

As method No. 2 involves ploughing the land and other operations connected with planting the crop each season, and the yields won by this method were no larger than those obtained by the first method, this experiment indicates that it may be found to be more profitable to allow the crop to remain on the land for at least two seasons without disturbing the tuberous roots.

The tops may be cut at any time, but it is thought to be inadvisable to cut them in the growing season before they have reached maturity, for premature reaping is likely to injure the tubers and to retard growth; but during the winter season, when lack of soil moisture combined with low temperatures have caused a cessation of growth, all the top growth may be removed without causing injury to the underground part of the crop.

## SUMMER WHEAT.

Since the commencement of experimental work at this station over 200 varieties of wheat have been received and

tested, nearly every civilised country in the world having contributed its quota to our collection. These experiments have been conducted with a view to obtaining a variety which is suitable for cultivation during the summer months. In spite of the prolonged endeavour, no variety which will consistently produce a large enough yield to justify its cultivation on a large scale has yet been found. A recent introduction from Kenya Colony, named Kenya Governor, has given yields as high as nine bags per acre when grown under favourable conditions and on heavily manured soil, but if maize had been planted instead of wheat, a yield of over twenty bags per acre could have been expected. Insect pests, fungoid diseases, birds and game combine to reduce the yields, and it is thought that under farm conditions average yields of only four bags per acre could be expected from soil capable of producing twelve bags per acre of maize. The quality of this summer-grown wheat is fairly satisfactory, rough tests indicating that it compares favourably with the wheats grown on vlei lands during the winter months. Poultry farmers and others who require wheat for home consumption only might find in the Kenya Governor a variety which would meet their needs. It has been observed here that the crop is better able to resist rust and some other diseases when it is grown on fertile soil, and if there is any doubt about the fertility of his soil the farmer should dress it with 400 lbs. per acre of complete fertiliser at ploughing time and give the growing crop a top dressing of 50 lbs. to 100 lbs. of nitrate of soda or sulphate of ammonia about a month after sowing. Fifty to sixty pounds of seed per acre are required, and the best period for planting is between 15th December and 10th January. The crop requires from three to four months to ripen, according to whether the season is a dry or wet one.

## BROWN HORSE GRAM.

This is a new introduction of recent date, it having been first grown on a small trial plot in 1925-26. It is an Indian crop resembling a dwarf pea, but its thin twining stems, which are produced in profusion, are much finer than those of the pea. Its numerous branches grow to a length of two or more feet, and become intertwined with one another in such a manner that they form a densely matted

covering over the surface of the ground from 9 ins. to 1 ft. deep. So far the crop has not been seriously damaged by insect pests, and although its lower leaves become infected with a white mildew toward the end of the season, which reduces the crop of seed by 10 per cent. to 20 per cent. in wet seasons, yet its yield is usually satisfactory. It is a very hardy plant and has thriven each year since its introduction, whether the rainfall has been above or below the normal amount. Its chief use would be as a cover crop, and it is thought that it may be found suitable for sowing under maize on areas infected with witch-weed, for, by reason of the blanket-like covering formed by its vines, the witch-weed would be prevented from seeding freely and would thus be kept under control, if not completely eradicated.

## MEXICAN MARIGOLD ERADICATION EXPERIMENTS.

Some four years ago, when the Mexican marigold threatened to over-run the countryside, means for effecting its destruction through the agency of various chemicals were sought. It was found that the arsenical cattle dips commonly used could be employed for this purpose by spraying them on to the stems and foliage of the weed, after dilution with 250 parts of water; but soon after the growing plant had been destroyed by these means, a new crop of seedlings appeared, and eventually it became apparent that several successive sprayings, continued over a period of two or three years, would be needed to eradicate the weed completely.

Another method of attack was sought for, and this time a piece of marigold-infested land was ploughed up and planted with three kinds of grass chosen for their hardiness and vigour, namely, Guinea grass, Napier grass and tussock grass. The roots of these were planted at 18 ins. apart each way. They rooted satisfactorily, but a luxuriant crop of marigold grew and seeded on the plot that season. During the next year the grasses made satisfactory progress, and a reduced crop of marigold also came to maturity. During the third season, however, the tussock grass grew so luxuriantly that it practically ousted the marigold, and since then no marigold plants more than 2 or 3 ins. high

have been found on this plot, and these appear too stunted to produce virile seed.

The Guinea and Napier grasses have not proved so useful for this purpose, for although they grew satisfactorily and ousted the greater part of the marigold, they have not completely destroyed it, as the tussock grass appears to have done. Although this method may not be practicable under all circumstances, it at least indicates one way in which useless marigold-infested land may be converted into useful pasturage.

## CROP SELECTIONS.

Four years ago a number of Kherson and Kinvarra oat plants, which appeared to possess superior rust-resisting powers and general vigour, were isolated for further testing. The seed of the individual plants was kept separate anl sown in a plot by itself the following season. Trials with these have been conducted each year with the object of obtaining pure strains which will be suitable for summer cultivation. About 450 separate strains have been isolated and tested since this work began. The Kherson selections have given very encouraging results, and yields of hay equal to 2½ tons per acre, and 900 lbs. of seed weighing 40 lbs. per bushel, have been obtained. These strains are not completely immune to rust, but when they are grown on fertile land they are sufficiently robust to be able to resist its attacks and to return profitable crops of fodder to the cultivator. Trials with these selections are not yet concluded, but the seed of some of them has been bulked and sent to the Gwebi Farm for further trial and multiplication. A limited quantity of this partially improved seed will be available for farmers for sowing next season. Intending growers should note that oats prefer fertile land and respond well to dressings of kraal manure applied to a previous crop. Owing to the smallness of the seed of the Kherson variety, 25 lbs. to 30 lbs. per acre are sufficient when the crop is to be reaped for seed, but if the production of fodder is aimed at, from 35 lbs. to 45 lbs. of seed per acre are required to produce the fineness of stem usually associated with quality. The best time for sowing the grain crop is from the middle of December to

the first week in January. If a fodder crop is required, the best results are obtained when the seed is sown before the middle of January, but sowings may continue until as late as the middle of February, with fairly satisfactory results if the season is a favourable one. None of the Kinvarra selections has given satisfactory results.

**S.E.S. Oats.**—In 1926 a few pounds of "Burt" oats were secured for inclusion in our variety trials. It was found that 99 per cent. of the plants in the resulting crop succumbed to rust, but a few of the remainder had rust-resistant qualities. Ears from the more promising of these plants were harvested separately, and from these some fifty pure strains have been under trial. This variety has been named after this station. It is very robust, often attaining to a height of over five feet on fertile land. Such vigorous growth may be considered too coarse for good hay, but it would be valuable for silage or for feeding in the green state. It requires five months to mature and should therefore be sown before the middle of December.

**Hull-less Oats.**—In 1927 it was found that a few plants among our Kherson and Kinvarra selections had accidentally become hybridised with a hull-less variety of oat. The first generation of hybrids proved to be as resistant to rust as their Kherson and Kinvarra parents, and when threshed, most of the kernels separated from the husks after the manner of the hull-less parent. The possibility of obtaining a new variety of oat which would be suitable for summer cultivation and yield grain of high quality for poultry and other farm live stock was apparent. Each plant resulting from this hybrid seed yielded enough seed for sowing duplicate plots during the season under review. Of the 320 hybrids tested in this way, about a dozen appear to possess the desirable qualities of both parents. These will be subjected to further tests.

**Sunflower Selections.**—Steps similar to those described above have been taken to improve both the Large Black and the White sunflower crops. The chief defects of the sunflower crop of this Colony arise through lack of purity of the kinds available, which have seed of low quality and mixed colours, and lack uniformity in their period of

growth. The aim in making these selections has been to secure strains which will give heavy yields of high quality grain, genetically pure for either blackness or whiteness of their seed. A strain of the Large Black variety has been secured which gives satisfactorily heavy yields and good quality grain. The bushel weight of this grain is one or two pounds less than that of the Small Black variety, but as its yields are 20 per cent. higher than those of the Small Black, it is considered to be the more profitable one to grow, particularly for home consumption. This seed has been sent to the Gwebi Farm for multiplication. The very low quality of the grain of the White sunflower has made it more difficult to secure strains of this kind which are likely to be profitable to grow on a commercial scale. Very considerable improvement has been effected, but in both yield and quality of grain the white strains are still below the standard of the black strains. However, to some extent the lower yield might be balanced by the higher market value of the white seed. This work is being continued with a view to effecting still further improvement with both these crops.

*(To be concluded.)*

## ERRATUM.

Page 465, May issue *Rhodesia Agricultural Journal*, under Group IV., period of growth, read 155 days instead of 135 days.

# Southern Rhodesia and the South African Butter Stabilisation Association.

At a series of meetings of dairymen and others held in February last under the auspices of the Union Department of Agriculture, representatives of practically all the creameries, dairies and cold storage establishments in the Union of South Africa, South-West Africa and Bechuanaland decided to form an association to be known as the South African Butter Stabilisation Association for the purpose of stabilising the price of butter throughout the territories concerned and of arranging for the export of their surplus butter, if any, after providing for home requirements.

The Department of Agriculture of this Colony was consulted and gave the movement its cordial support. As a result the creameries, etc., of Southern Rhodesia were invited and have agreed to take part in the newly-formed Association, and Southern Rhodesia will have one representative on the Executive Council of the Association.

The participation of the creameries of Southern Rhodesia is limited to one year certain. Should the anticipated benefits from the scheme materialise, no doubt their participation will continue.

The general principle of the scheme is the same as that of a similar one, known as the "Patterson Scheme," now operating in Australia, viz.:—After providing for home requirements, the surplus butter, if any, is exported, the marketing of this export surplus being undertaken by the Association. The cost of the marketing of this export surplus abroad is to be defrayed from a levy of ¼d. a lb. on all creamery butter manufactured by members of the Association. Members also agree not to import butter from oversea countries unless it can be shown that requirements cannot be satisfied locally.

An essential part of the scheme is the collection and prompt dissemination of the quantities produced and held in stock, both at creameries and cold stores. So far as Southern Rhodesia is concerned, the necessary machinery was provided by Government Notice No. 253 of 19th April, 1929.

The first returns under this Notice have now been collected for the month of April last, and the complete returns for Southern Rhodesia and the other States participating in the scheme are given below:—

## SOUTH AFRICAN BUTTER STABILISATION ASSOCIATION.

Return of the production of butter during the month of April, 1929, and the stocks of butter held by member creameries, butter factories and cold stores on 30th April, 1929.

### A. Production and Stocks.

| Producing area | Butter produced by creameries during month. | Stock of butter at end of month. |
|---|---|---|
| | Lbs. | Lbs. |
| Southern Rhodesia ... ... ... ... ... | 155,432 | 320,308 |
| Union of South Africa ... ... ... | 2,111,257 | 4,623,839 |
| Bechuanaland ... ... ... ... ... ... | 41,832 | 21,500 |
| South-West Africa ... ... ... ... | 307,921 | 85,937 |
| Total for Association ... ... | 2,616,442 | 5,051,584 |

### B. Composition of Stocks.

| Kind of butter. | Total for association. | Of which in S. Rhodesia. |
|---|---|---|
| | Lbs. | Lbs. |
| Creamery Butter ... ... ... ... ... | 4,208,787 | 251,931 |
| Farm Butter ... ... ... ... ... ... ... | 275,176 | 1,013 |
| Imported Butter— | | |
| South African ... ... ... ... ... | 472,571 | 52,300 |
| Overseas ... ... ... ... ... ... ... | 95,050 | 15,064 |
| Totals ... ... ... ... ... ... ... ... | 5,051,584 | 320,308 |

# Pests of Maize in Southern Rhodesia.

## THE MAIZE STALK BORER (*GLOTTULA FUSCA*, HMPSN.).

The following is extracted from the annual report of the Chief Entomologist for the year 1928:—

Records have been made of time of emergence of adult moths from the over-wintering borers. This appears to have been unusually late, probably due to meteorological influences. Trap crops were planted at the Experiment Station, Salisbury, and became infested in due course. The degree of protection afforded to the main plantings is not yet apparent. Burial of maize stalks infested with borer larvæ in loose soil at various depths resulted in no attempt on the part of the borers to make their way to the surface. Below two inches no moths reached the surface; even at two inches more moths failed than succeeded. Experiments were made involving removal of full-grown borer larvæ from the maize stalks to ascertain their behaviour. No attempt was made at any form of self-protection other than attempts to bore into anything which would yield to their jaws. Failing in these attempts, the larvæ all perished. Some experiments with "top dressing" maize against borer were carried out with two proprietary insecticides and Derris powder. All gave a satisfactory kill, but only the last-named failed to scorch the plants.

Attempts to hasten emergence of adult moths by exposing infested stalks to moist conditions gave negative results. The larvæ all died without pupating. Considerable infestation with a *Braconid* parasite was recorded in over-wintering borers in the open insectary. The parasite is thought to be *Bracon sesamiae*, and about 40 per cent. of the larvæ were attacked.

Field observations in August showed 7 per cent. only of stalks containing live borers in a crop which had been 90 per cent. infested. On one plot termites had rendered 64 per cent. of stalks uninhabitable by filling them up with mud.

Experiments have been carried out with treatment of maize seed to protect it against insect attack. Nearly all substances tested affected the germination in a greater or lesser degree. These experiments are being continued.

One application of poisoned bait, consisting of arsenite of soda 1 lb., sugar 8 lbs., in 10 gallons of water, carried on chopped Napier fodder (*Pennisetum purpureum*), killed over 95 per cent. of Snout Beetles (*Tanymecus destructor*, Mshll.) in an infested maize field near Salisbury.

A petroleum oil spray diluted at 1 in 30 proved an effective contact insecticide for adult weevils (*Calandra oryzae*, Linn.) in an infested granary in Salisbury.

# Exportation of Cattle from Southern Rhodesia on the Hoof for Overseas Markets.

It is hereby notified that payment of the Government bounty on cattle exported on the hoof to overseas markets will be subject to the animals being passed by a representative of the Government as suitable for export. Applications to participate in the bounty scheme must be forwarded to the Secretary, Department of Agriculture, Salisbury, thirty days before the date of despatch of the animals from Southern Rhodesia, so that arrangements can be made for their inspection.

D. McDONALD, Secretary,

Department of Agriculture.

# The Maize Market.

The world's maize situation is discussed in the following extract from *George Broomhall's Corn Trade News* of the 6th March, 1929:—

"The crux of the situation, we venture to think, is to be looked for on the plains of Argentina, where the new crop is now beginning to be harvested. The prospects are that the yield will be smaller than that from the harvest of last year and much smaller than from that of 1927. That by itself need not be cause for great concern, as a moderately smaller crop would fit in with the general scheme fairly well, as there can be little doubt that at the present price level the world's demand for maize is smaller than it was a while ago. During the past forty weeks of this season maize has disappeared into consumption in the deficiency countries at the rate of 750,000 quarters per week, whereas in the corresponding period of the preceding season the rate was 900,000 quarters per week. If next season the world's import requirements should amount to an average of 700,000 quarters per week, equal to 36,000,000 quarters per annum, an Argentine exportable surplus of 24,000,000 quarters would fit in very nicely, for then there would be room to spare for about 12,000,000 quarters of the surplus of the United States, Africa, Danubian countries, etc. The importance of the Argentine harvest just commencing can hardly be exaggerated from a consumer's point of view; if a fair return be got of good, dry grain, suitable for immediate shipment, he may be congratulated, for after a droughty summer and early autumn it would not be surprising if a wet spell were to ensue and check the early outward movement; his position then would be a parlous one, for there is nowhere he could go for relief except to Chicago, and there are many signs that America does not intend going on shipping at current prices. Nor will the consumer in Europe be able to fall back on liberal invisible reserves, as he has sometimes been able to do, for during the past weeks of severe weather a

big inroad must have been made into interior reserves. In the event of an unfavourable harvest-time occurring in the Plate, the consumer will have an anxious time, and the importing merchant will have to ration the visible stocks ashore and afloat very carefully. Fortunately these visible stocks, as mentioned above, are fairly substantial, sufficient perhaps to last until the end of April or early May.

"The cables received from Argentine during the past week contain very little news; harvest is now proceeding in the early districts under favourable weather conditions, and should become general before the end of the month. Latest weather reports mention rain rather frequently.

"It will be observed that the estimate of the exportable surplus of the present Argentine maize crop has been revised at 24,000,000 quarters or 57,600,000 bags of 200 lbs. net, in comparison with the probable export of 69,000,000 bags for the year ended 31st March, 1929, and the actual export of 81,352,000 bags for the year ended 31st March, 1928.

"Later information, however, is that the estimated exportable surplus for this season has been revised upwards to 61,200,000 bags, owing to more optimistic trade reports. The crop is of good quality and the lack of humidity has made a hard and small grain, with the moisture content well below the average.

"The demand in Europe, according to our Trade Commissioner's cable of the 6th April, continues to be very limited, which is apparently due to a number of causes, namely, the diminution of pig herds, good supplies of substitute feed stuffs, the partial disorganisation of transport as a result of the exceptionally severe winter, and the present relatively high price of maize. No doubt also the uncertainty of the outrun of the present Argentine maize crop has largely contributed to this temporary absence of buyers."

# Correspondence.

*[No responsibility is accepted by this Journal for the views expressed by correspondents.]*

The Editor,

*The Rhodesia Agricultural Journal.*

Sir,

*Tractor Ploughing Costs.*

The figures given below may be of interest to farmers who intend going in for tractor ploughing. The item spares is high, but this item will in future be reduced at least 50 per cent. with the new spring slip device supplied by Wm. Bain & Co., Ltd., connecting tractor to plough.

My tractor is a 15—30 McCormick-Deering.

| | s. | d. | |
|---|---|---|---|
| Petrol ... ... ... ... ... ... ... ... | 0 | 1 | per acre |
| Paraffin ... ... ... ... ... ... ... | 2 | 4 | ,, |
| Oil ... ... ... ... ... ... ... ... ... | 0 | 4 | ,, |
| Labour ... ... ... ... ... ... ... ... | 0 | 4 | ,, |
| Spares, tractor and plough ... | 0 | 10 | ,, |
| Total cost ... ... ... ... ... ... | 3 | 11 | ,, |

I worked with five discs and had a special roller attached to the plough, which really did two jobs at one time. Average depth, between 7 ins. and 8 ins.

I am, etc.,

TED. GRAY.

Brawlands,

P.O., Glendale,

2nd May, 1929.

The Editor,
*The Rhodesia Agricultural Journal.*
Sir,

*"Artificial Incubation, Brooding and Rearing of Chickens."*

May I, as one with some considerable experience in modern poultry breeding and egg production, make one or two comments on the article in the current number of the Journal on artificial incubation, by the Assistant Poultry Expert?

If I may say so, Mr. Wheeldon, as an expert, touches rather lightly on one point and rather dangerously upon another, both of which are pitfalls for the inexperienced. I refer to temperature and "cooling" (or "airing") respectively.

One should most certainly be careful that the thermometer is correct, but how many will realise the importance of having the thermometer tested before commencing a new season with it, unless it is a new one? I am afraid many poultry keepers would say, "Well, it looks all right," and yet very few thermometers will give correct readings year after year. The variation may be very slight; it may be one or two degrees—sufficient to ruin a season's hatches.

Furthermore, Mr. Wheeldon states the machine should be regulated to give an even temperature of 102½ degrees to 103 degrees in the egg chamber. Exactly! But whereabouts in the egg chamber? With few exceptions, manufacturers of incubators do not hatch eggs with them. They give airy instructions to run the machine at, say, 103 degrees, presumably to be recorded on the thermometer in the position in which it takes up when the machine is set up. Sometimes they are a little more definite, and say (where the thermometer suspension is adjustable), "Set it two inches above the bottom of egg tray."

If the incubatist wishes for the best results, let him or her see that 102½ degrees to 103 degrees, preferably the latter, is recorded with the *bulb* of the thermometer resting level with the top of the eggs. In machines with the thermometer fixed so that it swings entirely clear of the eggs, a temperature of 105 degrees will not be too high for the first week. Many (indeed, large numbers of) "dead in shell" and dead germs have been traced to an insufficient temperature at egg level during the first week of incubation. A very simple experiment with one or more thermometers will convince any poultry breeder of the very rapid drop in tem-

perature between the "ceiling" of the interior of his machine and the bottom of the egg tray.

The second point I mentioned at the commencement of this letter—that of the cooling and airing of eggs—might, I think, have been dealt with more widely. It is another common cause of failure. But I am afraid I have already written at inordinate length, and although I feel that Mr. Wheeldon has left too much to the discretion of the operator, who, if he is inexperienced, cannot exercise much, I also feel I have taken up too much of your time already.

I am, etc.,

"OVA."

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The writer of the article in question comments as follows on the foregoing letter:—

"It would appear that 'Ova' has overlooked the fact that articles of this nature must of necessity be as concise as possible.

"With reference to the two points raised by 'Ova' *re* temperature and cooling of the eggs, it has been recommended in the article in question that the manufacturers' instructions for the different types of incubators must be closely followed. There are no infallible rules for the running of an incubator. The amount of moisture and ventilation required, the manner of turning and cooling the eggs and the many details of the operation cannot be indicated in a definite manner for every machine, and are subject to variation according to the make, the system of the machine and the external conditions under which the machine is being worked. The article emphasises the necessity of using reliable thermometers. The book of instructions issued with an incubator deals fully with the position of the thermometers in the egg chamber. In some machines the thermometer cannot be placed anywhere but in the correct position. A temperature of 105 degrees, which is suggested by 'Ova' during the first week of incubation, is too high for this period in Rhodesia. Too high a temperature during the first week of incubation is a definite cause of 'dead in shell' and broken yolks, and is more harmful than too low a temperature. This forces the development of the embryo chicks and is likely to cause premature hatching with unabsorbed yolks and fatal results."

## Dates of Meetings of Farmers' Associations, Southern Rhodesia.

| Name of Association. | Place of Meeting. | Secretary. | June. | July. |
|---|---|---|---|---|
| | | | 1929 | 1929 |
| Ayrshire—Sipolilo | Various farms | G. H. Cautherley | 8 | 13 |
| Banket Junction | Banket Hotel | A. M. Hutchinson | 7 | 5 |
| Beatrice District | Farmers' Hall, Beatrice | W. Krienke | 27 | 25 |
| Bindura | Bindura Farmers' Hall | W. E. Fricker | 14 | 12 |
| Bromley | Farmers' Hall, Bromley Siding | E. Taylor | 5 | 3 |
| Bubi | Queen's Mine | C. H. Olsen | 11 | 9 |
| Bulawayo Landowners' and Farmers' Association | Library Buildings, Bulawayo | W. A. Carnegie | 13 | 11 |
| Chakari | Dodington (June) | L. T. Tracey | 19 | 17 |
| Daisyfield | Daisyfield (June), Somabula (July) | L. E. Edwards | 15 | 13 |
| Darwendale—Trelawney | Various farms | Charles H. Tanner | 26 | 24 |
| Eastern Districts | Farmers' Hall, Chidza | W. E. Richards | 8 | 13 |
| Enkeldoorn | Enkeldoorn | C. N. Ludlowe | 4 | 2 |
| Enterprise | Farmers' Hall | W. Stobart | 4 | 2 |
| Essexvale | Essexvale | Col. D. Judson | 16 | 21 |
| Felixburg—Gutu | Trafalgar (June), Felixburg Store (July) | A. J. Bradshaw | 8 | 13 |
| Figtree Branch, R.L. and F.A. | Figtree Hotel | The Secretary | 4 | 2 |
| Gadzema | Gadzema | M. G. Leahy | 14 | 12 |
| Gatooma | Speck's Hotel | Col. J. A. Smith | 15 | 20 |
| Gatooma (Golden Valley Branch) | Golden Valley Hotel | C. K. James | 8 | 13 |
| Gazaland (South Melsetter) | Chipinga Hotel | J. Ward | 3 | 1 |
| Greystone | Quarrie Farm | P. J. van der Walt | ... | 13 |
| Gwanda | Lowenthal's Building, Gwanda | N. J. B. Nilson | 15 | 20 |
| Hartley | Hartley Hotel | S. H. Rylett | 8 | 13 |
| Headlands | Headlands | J. A. Eve | ... | ... |
| Hunter's Road | Hunter's Road | R. W. Twilley | 29 | 27 |
| Insiza South | Farm Lancaster | J. Campbell | ... | 11 |
| Inyazura | Inyazura | W. P. Frudd | 7 | ... |
| Lalapansi | Lalapansi | B. J. Ingle | 8 | 13 |
| Lomagundi | Sinoia | F. W. Robertson | ... | 12 |
| Lomagundi West | Various farms | A. A. Bisset | 9 | 14 |
| Macheke | Farmers' Hall, Macheke | R. O. Jackson | ... | ... |

| | | | | |
|---|---|---|---|---|
| Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association | Various Farms | T. R. Colam | 1 | 6 |
| Makwiro | Makwiro | W. L. Parsons | 21 | 19 |
| Marandellas | Marandellas Farmers' Hall | E. Cruikshank | 7 | 5 |
| Marandellas, Southern | Various farms | B. V. Cherry | 5 | 3 |
| Mashonaland | Mashonaland Farmers' Hall, Salisbury | C. Lamb | 14 | 12 |
| Matobo South | Farmers' Hall, Malundi Farm | A. G. Allan | 15 | 20 |
| Matopo Branch, R.L. and F.A. | Farmers' Hall, Malundi | W. Mirtle | 15 | 20 |
| Mazoe (Concession) | Concession Hotel | A. W. Laurie | 14 | 12 |
| Mazoe (Glendale) | Farmers' Hall, Glendale | James S. Brown | 12 | 10 |
| Melsetter | Court House, Melsetter | J. C. Kruger | 13 | 11 |
| Midlands Farmers and Stockowners | Royal Hotel, Gwelo | T. R. van Rooyen | 12 | 10 |
| Ngezi-Umniati | Harvieston, Enkeldoorn | Miss Harvie | 29 | 27 |
| North Umniati | ——— | J. F. Eagar | Not | received |
| Norton and Lydiate District | Norton | R. D. Palmer | 7 | 5 |
| Nyamandhlovu | Nyamandhlovu | R. D. McLean | ... | ... |
| Odzi District Farmers | Odzi Hotel | F. H. Burnett | 1 | 6 |
| Poorte Valley | Various places | A. D. Wilson | 15 | 20 |
| Que Que | Offices of the Que Que Sanitary Board | A. A. Ackerman | 15 | 20 |
| Rusape Farmers' Association | Rusape | R. Munch | 1 | 6 |
| Salisbury South | Various farms | P. Linton | 26 | 31 |
| Selukwe | The Hotel, Selukwe | W. T. Simpson | ... | ... |
| Shamva | Shamva Court House | W. Stanley-Stollard | 21 | 19 |
| Two Rivers Farming Association | Various farms | W. L. Parsons | 15 | 20 |
| Umboe (Branch of Lomagundi F.A.) | Various farms | C. W. S. Ford | 8 | 13 |
| Umvukwe Farmers' and Tobacco Growers' Association | Various ranches | Com. E. Wrightson | 8 | 13 |
| Umtali | Drill Hall, Umtali | A. Howat | 6 | 4 |
| Umvuma and District | Umvuma | S. T. Montgomery | Not | received |
| Victoria | Victoria | G. E. Lamb | 1 | 6 |
| Wankie District | ——— | F. H. Going | Not | received |
| West Umvukwe Farmers' Association | Various farms | G. H. Gordon | 1 | 6 |
| Western | Plumtree Hotel | The Secretary | 8 | 13 |
| Willoughbys | Willoughbys | A. E. Roberts | Not | received |

# Movements of New Settlers.

The following new settlers arrived in the Colony during the month of April, 1929:—

D. A. Holder.—Arrived from Great Britain on 2nd April, and proceeded to Mr. Tarrant, Delata Farm, for a period of training.

S. White.—Arrived from Union on 8th April, on tour of inspection.

H. L. Estment.—Arrived from Great Britain on 15th April, on tour of inspection.

J. H. Patterson.—Arrived from Great Britain on 15th April, on tour of inspection.

D. S. Durant.—Arrived from Union on 15th April, on tour of inspection.

A. Black.—Arrived from Great Britain on 16th April, and proceeded to Mr. Gordon Cooper, Chambrecy Farm, Essexvale, Bulawayo.

J. Laing.—Arrived from Great Britain on 18th April, and proceeded to Mr. Beattie, Dunphaile Farm, Banket, for a period of training.

J. Plummer.—Arrived from Great Britain on 19th April, and proceeded to the Lytton Estates, Ballyvaughan, Arcturus.

R. Gunnell.—Arrived from Great Britain on 23rd April, and proceeded to Mr. Denham, Longlands Estate, Marandellas.

R. C. Quinn.—Arrived from Union on 27th April, on tour of inspection.

D. C. E. Laurie.—Arrived from Union on 30th April, and proceeded to Mr. Laurie, Munwa Farm, Marandellas, for a period of training.

Mr. and Mrs. Martin.—Arrived from Union on 30th April, on tour of inspection.

# Southern Rhodesia Veterinary Report.

## March, 1929.

### AFRICAN COAST FEVER.

Melsetter District.—Two fresh outbreaks occurred; the mortality in each was one beast. At existing centres of infection the following mortality occurred, viz.:—Enhoek, 3; Canterbury, 4; Avontuur, 1.

### HORSE-SICKNESS.

Exceedingly heavy mortality is recorded. Matabeleland, 43; Salisbury, 7; Umtali, 2; Victoria, 7; Gwelo, 21; Melsetter, 8.

### CUTANEOUS MYIASIS (SCREW WORM) IN CATTLE.

Reported as prevalent in Bindura, Macheke, Mrewa and Bulawayo districts.

### ANTHRAX.

An outbreak occurred on the southern portion of the Salisbury Commonage. Mortality, two oxen and a donkey. In-contact cattle numbering 300 head were inoculated.

### TRYPANOSOMIASIS.

Two cases, Melsetter district.

### DISTOMATOSIS (FLUKE) IN CATTLE.

Seven deaths occurred in Salisbury district due to heavy infestation of fluke.

### SWEATING SICKNESS IN CALVES.

Prevalent in Salisbury, Bindura, Macheke, Mrewa, Beatrice and Victoria areas.

### SCAB.

One flock placed in quarantine, Melsetter district.

## WIRE WORM IN SHEEP.

Mortality reported to be due to this cause from several districts.

## IMPORTATIONS.

From the Union of South Africa: Bulls, 16; cows, 39; heifers, 15; calves, 6; horses, 5; mules, 10; donkeys, 25; sheep, 1,571; goats, 960; pigs, 13.

## EXPORTATIONS (CATTLE).

To Union of South Africa for local consumption, 12; for export, 1,353. To Belgian Congo: Slaughter, 1,845; breeding, 1,803. To Northern Rhodesia: Breeding, 19. To Portuguese East Africa: Slaughter, 24.

## EXPORTATIONS (MISCELLANEOUS).

To Union of South Africa: Pigs, 191. To Belgian Congo: Sheep, 70; goats, 55; pigs, 123. To Northern Rhodesia: Sheep, 290; goats, 109.

## COLD STORAGE EXPORTS TO THE CONGO.

Beef: Carcases, 292¼; tongues, 429; livers, 215; brains, 198; hearts, 162; tails, 231; tripes, 33; cheeks, 37; heels, 64. Calves: Carcases, 19; heads, 15; plucks, 11. Sheep: Carcases, 30; hearts, 185; tongues, 74. Goats: Carcases, 36.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

# Seed for Sale, Gwebi Farm.

Kinvarra Oats ... ... ... ... per 100 lbs. 25s.

Price is f.o.r. Gwebi. Cheques should be made payable to "Gwebi Farm." Orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury.

# Southern Rhodesia Weather Bureau.

## APRIL, 1929.

**Pressure.**—The barometric pressure during the month was about normal, varying from 0.013 in. above normal at Salisbury to 0.012 in. below normal at Fort Victoria.

**Temperature.**—The mean monthly temperature was below normal, varying from 3.2° F. below normal at Driefontein and Juliasdale to 0.6° F. above normal at Melsetter.

The mean maximum temperature was below normal, varying from 5.1° F. below normal at Hartley to 2.0° F. above normal at Essexvale.

The mean minimum temperature was below normal, varying from 4.8° F. below normal at Tuli to normal at Matopos.

The mean relative humidity was generally about normal.

**Rainfall.**—No rain of any importance fell during the month. A few thundershowers were recorded at the majority of stations, bringing the total for the season up to 34.33, as compared with the normal of 27.90. The rainfall season has been marked by its extremely late start and early end. Little of the rain was caused by disturbances originating in the south, and the major part occurred in conjunction with the movements of northerly lows. During January a very regular flow of humid air from the north-east prevailed and the rains were of the monsoon type.

## RAINFALL.

| STATION. | 1929. March. | 1929. April. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE A.: | | | | |
| Bubi— | | | | |
| Bembesi Railway ... | 6.47 | ... | 35.51 | 23.40 |
| Glenarton ... | 4.98 | ... | 28.33 | 25.32 |
| Inyati ... | 3.15 | ... | ... | 24.16 |
| Judsonia ... | 4.55 | ... | 30.96 | n.s. |
| Martha Farm ... | 4.91 | ... | 28.41 | 19.64 |
| Nduba Farm ... | 3.69 | ... | 33.65 | n.s. |
| Shangani Estate ... | 5.23 | ... | 32.97 | 24.81 |
| Bulalima-Mangwe— | | | | |
| Centenary ... | 7.23 | ... | ... | n.s. |
| Kalaka ... | 4.42 | ... | ... | 23.10 |
| Riverbank ... | 3.64 | .06 | 24.93 | 24.77 |
| Solusi Mission ... | 7.52 | .13 | 26.96 | 23.57 |
| Bulawayo— | | | | |
| Fairview Farm ... | 4.36 | ... | ... | 21.92 |
| Keendale ... | 4.27 | .30 | 26.89 | 22.03 |
| Lower Rangemore ... | 4.02 | ... | 30.79 | 23.51 |
| Observatory ... | ... | ... | ... | 23.38 |
| Waterworks ... | 9.14 | .16 | 34.86 | 23.66 |
| Gwelo— | | | | |
| Brockenhurst .. | 4.88 | ... | ... | n.s. |
| Frogmore ... | 5.70 | ... | 36.82 | n.s. |
| Gwelo Gaol ... | 5.95 | ... | ... | 25.76 |
| Riversdale Estate ... | ... | ... | ... | 29.11 |
| Somerset Estate ... | 4.80 | ... | ... | 25.13 |
| Insiza— | | | | |
| Orangedale ... | 5.42 | ... | 33.05 | 27.49 |
| Shangani ... | 4.33 | .15 | 31.51 | 23.69 |
| Thornville ... | 4.32 | .21 | 33.27 | 24.30 |
| Nyamandhlovu— | | | | |
| Gwaai Reserve ... | 3.37 | ... | 29.54 | 24.94 |
| Gwaai Siding ... | 3.16 | ... | 29.09 | n.s. |
| Naseby ... | 3.81 | .02 | 28.93 | 23.02 |
| Nyamandhlovu Railway ... | 5.51 | ... | 27.53 | 22.70 |
| Sebungwe— | | | | |
| Gokwe ... | 7.89 | ... | ... | 30.24 |
| Umzingwane— | | | | |
| Springs ... | 4.22 | .08 | 30.54 | 24.36 |
| Wankie— | | | | |
| Dett ... | 3.03 | ... | ... | 22.35 |
| Matetsi Railway ... | ... | ... | ... | 27.83 |
| Ngamo Railway ... | 5.51 | .07 | 26.66 | 26.31 |
| Rosslyn ... | 1.56 | .50 | 26.19 | n.s. |
| Sukumi ... | 3.24 | ... | 32.75 | 28.04 |
| Tom's Farm ... | 3.17 | ... | 34.39 | n.s. |
| Victoria Falls Railway ... | 3 69 | ... | ... | 27.60 |
| Wankie Hospital ... | 2.14 | ... | ... | 23.17 |

## RAINFALL—*(Continued)*.

| STATION. | 1929. March. | 1929. April. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **ZONE B.:** | | | | |
| **Belingwe—** | | | | |
| Bickwell .. | 5.78 | .57 | 30.34 | 22.58 |
| Sovelele ... | 3.86 | ... | ... | 21.19 |
| Tamba ... | 1.61 | .. | ... | 18.87 |
| Wedza .. | 5.73 | | ... | 23.97 |
| **Bulalima-Mangwe—** | | | | |
| Bruwapeg .. | 2.76 | ... | ... | 21.58 |
| Edwinton ... | 7.18 | ... | ... | 19.04 |
| Empandeni ... | 4.31 | ... | ... | 21.64 |
| Fallowfields ... | 4.39 | .10 | 24.47 | n.s. |
| Garth ... | 3.14 | .09 | 32.12 | 25.71 |
| Maholi ... | 3.04 | ... | ... | 27.87 |
| Retreat ... | 5.92 | ... | 31.90 | 21.34 |
| Sandown ... | 6.75 | ... | ... | 26.64 |
| Semokwe Reserve ... | 2.56 | .05 | 19.82 | n.s. |
| Tjankwa ... | 3.78 | .15 | 32 97 | 27.59 |
| Tjompani ... | 3.86 | .01 | 40.20 | 24.67 |
| **Chibi—** | | | | |
| Bubye ... | 2.53 | ... | ... | 14.85 |
| Mtendelende ... | 3.90 | ... | ... | 21.01 |
| Nuanetsi Homestead . | 3.83 | .. | .. | 16.37 |
| Nuanetsi N.C. . | 2.51 | .. | ... | n s. |
| **Gwanda—** | | | | |
| Gwanda Gaol ... | 3.67 | .36 | 28.71 | 20.66 |
| Mtetengwe .. | 2.57 | .54 | 15.15 | 12.53 |
| Tuli ... | 1.64 | .05 | 20.18 | 14.02 |
| **Insiza—** | | | | |
| Albany ... | 4.20 | ... | 30.47 | 24.01 |
| Filabusi ... | 3.53 | .28 | 27.20 | 21.68 |
| Fort Rixon ... | 3.47 | . | 26.25 | 22.36 |
| Inyezi ... | 8 86 | .47 | 35.23 | 23.10 |
| Lancaster ... | 5.26 | .02 | 30.75 | 25.58 |
| Saleby ... | 9 99 | .29 | 30.90 | n.s. |
| Wanezi Mission ... | 6.29 | .49 | 32.16 | n.s. |
| **Matobo—** | | | | |
| Bon Accord ... | 2.71 | .75 | 27.71 | n.s. |
| Fort Usher ... | 5.64 | ... | 32.21 | n.s. |
| Holly's Hope ... | 3.21 | .31 | 28.80 | 21.40 |
| Longsdale ... | 6.47 | ... | 32.20 | n.s. |
| Matopo Mission ... | 4.42 | ... | ... | 25.75 |
| Mtshabezi Mission ... | 3.66 | .64 | 27.66 | 21.85 |
| Rhodes Matopo Park ... | 4.26 | .01 | 31.10 | 28.53 |
| **Umzingwane—** | | | | |
| Balla Balla ... | 5.32 | ... | ... | 24.33 |
| Essexvale ... | 3.94 | .64 | 34 80 | 24.52 |
| Hope Fountain ... | 5.69 | .11 | 34.19 | 26.63 |

## RAINFALL—(*Continued*).

| Station. | 1929. March. | 1929. April. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone C.:** | | | | |
| Charter— | | | | |
| Bushy Park ... | 6.91 | ... | ... | 30.75 |
| Enkeldoorn ... | 8.92 | ... | 46.78 | 28.97 |
| Marshbrook ... | 4.11 | ... | ... | 29.87 |
| The Range ... | 7.07 | ... | 39.13 | 30.82 |
| Vrede ... | 5.10 | .10 | 32.50 | 31.53 |
| Chilimanzi— | | | | |
| Beacon Hill ... | 4.78 | .17 | 35.73 | 32.39 |
| Central Estates ... | 8.11 | 06 | 45.33 | 32.62 |
| Fourie's Post ... | 5.14 | ... | 35.76 | 27.62 |
| Orton's Drift ... | 5.80 | ... | 36 08 | 26.62 |
| Sebakwe Post ... | 4.10 | ... | 30.08 | 24.46 |
| Umvuma Railway ... | ... | ... | ... | 28.17 |
| Gwelo— | | | | |
| Cross Roads ... | 3.73 | ... | ... | 29.72 |
| Delano Estate ... | 4.81 | ... | 35.73 | n.s. |
| East Clare Ranch ... | 6.48 | ... | 33.22 | 33.24 |
| Forestvale ... | 4.59 | .20 | 36 57 | n.s. |
| Globe and Phœnix Mine ... | 6.00 | ... | 35.12 | 28.42 |
| Lannes Farm ... | 6.32 | ... | ... | n.s. |
| Lalapanzi ... | 5.82 | ... | ... | 33 50 |
| Lyndene ... | 7.40 | ... | ... | 27.84 |
| Woodendhove ... | 6.62 | .60 | 39.87 | 30.16 |
| Wold Farm ... | 4.93 | .23 | 36.82 | n s. |
| Hartley— | | | | |
| Ardgowan ... | 4.97 | ... | 30.70 | 31.51 |
| Balwearie ... | 6.58 | ... | ... | 34.51 |
| Battlefields ... | 6.28 | ... | 38.24 | 29 11 |
| Beatrice ... | ... | ... | ... | 33.52 |
| Carnock ... | 4.91 | ... | 28.34 | 31.75 |
| Cromdale .. | 4.85 | ... | 32.65 | 33.00 |
| Currandooley ... | 5.14 | ... | 30 66 | n.s. |
| Eiffel Blue Mine ... | 8.10 | ... | 30.00 | 27.43 |
| Elvington ... | 7.25 | ... | 31.81 | 30.48 |
| Gatooma ... | 8.67 | ... | ... | 31.91 |
| Gatooma Experiment Station | 9.37 | ... | ... | n.s. |
| Gowerlands ... | 4.86 | ... | 33.59 | 30.88 |
| Handley Cross ... | 6.48 | ... | 31.34 | n.s. |
| Hartley Gaol ... | 8.70 | ... | 35.73 | 32.22 |
| Hopewell ... | 3.91 | ... | ... | 32.32 |
| Maida Vale ... | 7.34 | ... | 30.43 | 28.94 |
| Meadowlands ... | 4.50 | .18 | 31.20 | n.s. |
| Nyadgori ... | 3.73 | ... | ... | 30.11 |
| Pulham ... | 6.05 | .49 | 33.12 | 33.19 |
| Ranwick ... | 9.59 | ... | 30.42 | 33.42 |
| Sunny Bank ... | 5.86 | ... | 30.34 | n.s. |
| Thorndyke ... | 2.57 | .56 | 26.09 | 27.16 |

## RAINFALL—(*Continued*).

| Station. | 1929. March. | 1929. April. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| Zone C.—(Continued) | | | | |
| Lomagundi— | | | | |
| Argyle ... | 7.66 | ... | ... | 31.82 |
| Baguta ... | 7.70 | .99 | 33.74 | 34.17 |
| Between Rivers ... | 7.60 | .66 | 31.74 | n.s. |
| Citrus Estate ... | 6.91 | .45 | 30.90 | 32.21 |
| Dalston ... | 8.78 | .40 | 31.75 | n.s. |
| Dartmoor ... | 7.50 | .28 | 27.71 | n.s. |
| Darwendale ... | 9.88 | ... | ... | 30.94 |
| Devonia ... | 7.58 | .33 | 37.29 | 31.36 |
| Dingley Dell ... | 3.95 | .70 | 25.79 | 31.30 |
| Gambuli ... | 6.27 | ... | ... | 34.58 |
| Kapiri ... | 8.67 | ... | ... | 34.21 |
| Kashao ... | 7.25 | ... | ... | n.s. |
| Kenidia ... | 6.87 | ... | ... | n.s. |
| Mafoota ... | 9.42 | 1.60 | 39.41 | 30.22 |
| Maningwa ... | 5.82 | ... | ... | 32.47 |
| Miami ... | 4.87 | .99 | 31.55 | n s. |
| Mica Field ... | 5 76 | .38 | 36.33 | 30.28 |
| Montrose ... | 8.72 | ... | ... | 33.08 |
| Mpandegutu ... | 7.27 | ... | ... | 32.95 |
| Msina ... | 4.52 | ... | ... | n.s. |
| Mukwe River Ranch ... | 8 05 | .44 | 39.15 | 30.89 |
| Nyapi ... | 6.25 | .57 | 28.35 | 31.99 |
| Nyarora ... | 6.82 | .18 | 28.87 | 29.99 |
| Palm Tree Farm ... | 11.96 | .52 | 35.99 | 31.53 |
| Pendennis ... | 4.55 | ... | ... | n.s. |
| Raffingora ... | 8.74 | .43 | 37.15 | 29.93 |
| Renardia ... | 10.05 | .04 | 37.51 | n.s. |
| Richmond ... | 4 82 | .08 | 31.38 | 27.52 |
| Robbsdale ... | 8.63 | ... | ... | n.s. |
| Romsey ... | 7.99 | .66 | 36.38 | 32.50 |
| Silater Estate .. | 8.57 | 1.66 | 36.48 | 34.32 |
| Sinoia ... | 7.34 | .41 | 32.00 | 30.99 |
| Sipolilo ... | 9 88 | .63 | 44.11 | 32.60 |
| Umvukwe Ranch ... | 7.99 | ... | ... | 32.79 |
| Woodleigh ... | 10.33 | .45 | 31.55 | 34.87 |
| Yeanling ... | 7.37 | .83 | 29.62 | 32.03 |
| Zebra Vlei ... | 10.02 | .53 | 33.93 | 30.51 |
| Marandellas— | | | | |
| Rocky Spruit ... | 6.40 | ... | ... | n.s. |
| Mazoe— | | | | |
| Pembi Ranch .. | 7.18 | .36 | 37.11 | n.s. |
| Salisbury— | | | | |
| Avondale (Broadlands) ... | 8.02 | ... | ... | 31.84 |
| Ballineety ... | 5.17 | .85 | 30.32 | 32.40 |
| Botanical Experiment Station | 6.30 | ... | ... | 29.51 |
| Bromley ... | 7.24 | .26 | 34.39 | 33.50 |
| Cleveland Dam ... | 7.09 | .08 | 37.27 | 31.76 |
| Forest Nursery ... | ... | .33 | ... | 32.49 |
| Gwebi ... | 5.50 | ... | ... | 32.54 |

## RAINFALL—(*Continued*).

| STATION. | 1929. March. | 1929. April. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE C.—(Continued) | | | | |
| Salisbury (continued)— | | | | |
| Salisbury Agricultural Dept. | 6.79 | .08 | 31.41 | 31.33 |
| Sebastopol ... | ... | ... | ... | 33.31 |
| Stapleford ... | ... | ... | ... | 33.93 |
| Tobacco Experiment Station | 5.49 | ... | 27.30 | n.s. |
| Western Commonage ... | 5.93 | .40 | 31.79 | 29.43 |
| Sebungwe— | | | | |
| Sikombela ... | 7.39 | ... | ... | 32.23 |
| Wolverley ... | 7.86 | ... | 41.49 | 28.26 |
| ZONE D. : | | | | |
| Darwin— | | | | |
| Cullinan's Ranch ... | 6.37 | ... | ... | n.s. |
| M'gadzi ... | ... | ... | ... | n.s. |
| Mount Darwin ... | 4.89 | ... | 26.63 | 29.89 |
| Rusambo ... | 5.87 | ... | ... | n.s. |
| Inyanga— | | | | |
| Inyanga ... | 5.88 | .33 | 46.50 | 37.07 |
| Juliasdale ... | 12.15 | .28 | 52.57 | 44.29 |
| Rhodes Estate ... | 9.47 | .34 | 56.88 | 42.72 |
| Makoni— | | | | |
| Ardlamont ... | ... | ... | ... | n.s. |
| Eagle's Nest ... | 5.96 | .06 | 46.77 | 33.10 |
| Mayo Ranch ... | 5.62 | ... | ... | n.s. |
| Wensleydale ... | ... | ... | ... | 33.72 |
| Mazoe— | | | | |
| Argyle Park ... | 8.34 | ... | ... | n.s. |
| Atherstone ... | 8.66 | ... | ... | 34.38 |
| Bellevue ... | 9.10 | .19 | 33.07 | n.s. |
| Bindura ... | 6.23 | ... | ... | 33.36 |
| Ceres ... | 11.44 | .59 | 44.94 | 37.41 |
| Chipoli ... | 8.50 | ... | ... | 33.01 |
| Citrus Estate ... | 9.55 | ... | 38.76 | 34.46 |
| Craigengower ... | 7.96 | 2.86 | 38.90 | 33.39 |
| Dandejena ... | 7.23 | ... | ... | n.s. |
| Donje ... | 8.06 | .45 | 40.52 | n.s. |
| Frogmore ... | 6.27 | ... | ... | 33.95 |
| Glen Divis ... | 9.07 | ... | ... | 39.12 |
| Glen Grey ... | 8.08 | 1.23 | 35.36 | 29.32 |
| Great B ... | 10.11 | .30 | 35.47 | 33.79 |
| Hinten ... | ... | ... | ... | n.s. |
| Horta ... | ... | ... | ... | 33.90 |
| Kilmer ... | 7.54 | ... | ... | 33.16 |
| Kingston ... | 7.28 | .14 | 38.18 | 37.77 |
| Maienza ... | 10.57 | ... | ... | 36.03 |
| Mazoe Dam ... | 9.17 | .13 | 31.37 | 35.18 |
| Mgutu ... | 7.22 | .27 | 36.60 | 39.11 |
| Muripfumba ... | 6.10 | ... | ... | 30.65 |
| Omeath ... | 7.43 | ... | ... | 32.92 |

## RAINFALL—(*Continued*).

| Station. | 1929. March. | 1929. April. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE D.—(Continued) | | | | |
| Mazoe (continued)— | | | | |
| Pearson Settlement ... | 8.42 | ... | ... | 35.61 |
| Riversdale Estate ... | 6.93 | ... | ... | n.s. |
| Ruia ... | 8.05 | 2.25 | 41.86 | 36.23 |
| Rustington ... | 8.60 | ... | ... | 31.19 |
| Shamva Mine ... | 10.68 | .33 | 38.37 | 33.34 |
| Stanley Kop ... | 7.81 | ... | 28.70 | 31.40 |
| Sunnyside ... | 8.99 | .12 | 38.42 | 34.25 |
| Teign ... | 7.75 | 1.66 | 37.26 | 33.90 |
| Usk ... | 9.79 | ... | ... | 39.62 |
| Virginia ... | 8.88 | .75 | 38.48 | 32.35 |
| Visa ... | 6.64 | 1.89 | 34.24 | n.s. |
| Woodlands ... | 12.52 | ... | ... | 37.08 |
| Zombi Farm ... | 8.66 | ... | ... | 37.85 |
| Mrewa— | | | | |
| Maryland ... | 9.46 | ... | 35.06 | n.s. |
| Montclair ... | 9.83 | .02 | 39.98 | n.s. |
| Mrewa ... | 6.24 | ... | ... | 34.74 |
| Nyaderi Mission ... | 7.79 | .03 | 31.89 | n.s. |
| Selous Nek ... | 9.39 | ... | 32.21 | 33.07 |
| Mtoko— | | | | |
| Makaha ... | 6.60 | ... | 39.84 | 34.08 |
| Mtoko (N.C.) ... | 4.70 | .55 | 34.79 | 28.15 |
| Salisbury— | | | | |
| Arcturus ... | 9.02 | .22 | 42.62 | 39.95 |
| Chindamora Reserve ... | 7.18 | .43 | 32.09 | 36.41 |
| Datata ... | 7.55 | ... | ... | n.s. |
| Glenara ... | 5.86 | ... | ... | 32.97 |
| Goromonzi ... | 7.95 | .06 | 40.90 | 36.76 |
| Hatcliffe ... | 5.42 | ... | ... | 35.21 |
| Hillside (Bromley) ... | 5.21 | ... | 33.76 | 38.50 |
| Kilmuir ... | 5.19 | .07 | 40.24 | 41.38 |
| Meadows ... | 8.65 | .02 | 45.81 | 39.93 |
| Pendennis ... | 7.10 | .46 | 35.33 | n.s. |
| Selby ... | 7.31 | ... | ... | 31.59 |
| Springs ... | ... | ... | ... | 37.05 |
| Teviotdale ... | 5.86 | .66 | 33.31 | n.s. |
| Vainona .. | 5.30 | 1.07 | 35.71 | 33.14 |
| ZONE E.: | | | | |
| Belingwe— | | | | |
| Belingwe (N.C.) ... | 7.31 | .27 | 32.48 | 22.19 |
| Doro ... | 4.16 | ... | 27.47 | 23.96 |
| Shabani ... | ... | ... | ... | 25.61 |
| Bikita— | | | | |
| Angus Ranch ... | 4.31 | ... | ... | 22.88 |
| Bikita ... | 15.73 | .07 | 41.93 | 37.43 |
| Devuli Ranch ... | 4.58 | ... | ... | 20.87 |
| Pamushana ... | 8.19 | ... | 38.17 | 34.31 |

## RAINFALL—*(Continued)*.

| Station. | 1929. March. | 1929. April. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| Zone E.—(Continued) | | | | |
| Charter— | | | | |
| Buhera ... | 5.82 | ... | ... | 34.13 |
| Chibi— | | | | |
| Chibi ... | 5.54 | .04 | 30.12 | 23.34 |
| Lundi ... | 10.92 | .. | ... | 25.57 |
| Mpapas ... | 2.40 | ... | ... | 23.25 |
| Chilimanzi— | | | | |
| Allanberry ... | 6.07 | .14 | 37.01 | 28.45 |
| Driefontein ... | 10.24 | ... | ... | 26.98 |
| Felixburg ... | 6.16 | ... | ... | 29 53 |
| Grootfontein ... | 5.82 | ... | 38.94 | 27.91 |
| Induna Farm ... | 7.75 | .16 | 38.78 | 31.75 |
| Mtao Forest ... | 5.75 | .. | ... | 29.60 |
| Mukowries ... | 10.80 | .02 | 50.22 | n.s. |
| Thornhill ... | 9.33 | ... | ... | n.s. |
| Gutu— | | | | |
| Alheit Mission ... | 4.67 | ... | ... | 24.63 |
| Chindito ... | 35.97 | ... | ... | n.s. |
| Eastdale Estates ... | 6.61 | ... | ... | 33.69 |
| Gutu (N.C.) ... | 11.51 | .. | ... | 29.55 |
| Glenary ... | 13.25 | ... | 49.30 | 26 19 |
| Gwelo— | | | | |
| Glencraig ... | 8.98 | ... | ... | n.s. |
| Partridge Farm ... | 10.23 | .11 | 41.02 | 35.75 |
| Sheep Run Farm ... | 8.21 | ... | ... | 29.55 |
| Inyanga— | | | | |
| St. Trias' Hill ... | 11.58 | ... | 48.07 | 38.82 |
| Insiza— | | | | |
| Roodeheuvel ... | 8.63 | ... | ... | 27.26 |
| Stoneham (Brac Valley) ... | 5.89 | .07 | 38 89 | n.s. |
| Makoni— | | | | |
| Bude ... | 12.41 | .47 | 45.86 | n.s. |
| Chirumwe ... | 8.38 | ... | ... | n s. |
| Craigendoran ... | 9.79 | ... | ... | 33.97 |
| Forest Hill ... | ... | ... | .. | 35.16 |
| Inyagura ... | ... | ... | ... | n.s. |
| Mona ... | 7.65 | ... | ... | 37.81 |
| Monte Cassino ... | 6.00 | .03 | 49.32 | 34.53 |
| Ruati ... | 9.08 | .27 | 41.93 | n.s. |
| Rusape (N.C.) ... | 9.11 | .. | ... | n.s. |
| Springs ... | 5.56 | .26 | 40.94 | 33.08 |
| Whitgift ... | 7.68 | .25 | 46.30 | n.s. |
| Marandellas— | | | | |
| Bonongwe ... | 6.95 | .50 | 49.88 | 32.65 |
| Delta ... | 5.72 | .07 | 44.52 | 36.55 |
| Elandslaagte ... | 10.75 | .13 | 52.78 | 33.23 |
| Lushington ... | 5.99 | .05 | 41.03 | n.s. |
| Macheke ... | 5.95 | .59 | 46.16 | 33.95 |
| Marandellas (N.C.) ... | 10.01 | .09 | 42.56 | 35.80 |
| Marandellas Estate ... | 6.17 | ... | ... | 30.17 |

## RAINFALL—(*Continued*).

| STATION. | 1929. March. | 1929. April. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE E.—(Continued) | | | | |
| Marandellas (Continued)— | | | | |
| Nelson ... | ... | ... | ... | 30.18 |
| We za Reserve ... | 8.69 | .40 | 54.75 | n.s. |
| Wenimbi ... | ... | 8.07 | ... | n.s. |
| Melsetter— | | | | |
| Brackenbury ... | 19.01 | ... | ... | 55.48 |
| New Year's Gift ... | 4.97 | ... | ... | n.s. |
| Sabi Tanganda Estate ... | 3.25 | ... | 25.58 | n.s. |
| Ndanga— | | | | |
| Bangala Ranch ... | 5.50 | ... | ... | n.s. |
| Doornfontein ... | 9.19 | .26 | 39.88 | 29.69 |
| Marah Ranch ... | 8.26 | ... | 44.87 | 30.61 |
| Tri ngle Ranch ... | 2.73 | ... | 25.05 | 23.46 |
| Zaka ... | ... | ... | ... | n.s. |
| Selukwe— | | | | |
| Aberfoyle Ranch ... | 4.93 | .07 | 41.57 | 30.94 |
| Hillingdon ... | 10.88 | ... | ... | 33.84 |
| Impali Source ... | 11.23 | ... | 43.73 | 29.41 |
| Rio ... | 8.45 | ... | 40.60 | 30.77 |
| Safago ... | 8.33 | .02 | 39.84 | 33.51 |
| Selukwe ... | 14.14 | ... | ... | 43.41 |
| Umtali— | | | | |
| Argyle ... | 8.92 | .29 | 43.04 | 33.00 |
| Embeza ... | 14.46 | ... | ... | n.s. |
| Fairview ... | 5.31 | ... | ... | n.s. |
| Jerain ... | 4.41 | ... | ... | 31.62 |
| Mutambara Mission ... | 4.47 | .03 | 40.06 | 28.21 |
| Odzani Power Station ... | 8.07 | .20 | 58.10 | 37.03 |
| Park Farm ... | 8.66 | .51 | 63.31 | 45.05 |
| Premier Estate ... | 6.42 | .51 | 48.50 | 31.41 |
| Sarum ... | 5.57 | .43 | 43.86 | 30.99 |
| Sheba ... | 19.29 | 2.31 | 83.92 | n.s. |
| Stapleford ... | 13.55 | 1.47 | 94.29 | 67.07 |
| St. Augustine's Mission ... | 7.03 | .75 | 54.83 | 40.54 |
| Transsau Estate ... | 8.34 | .25 | 40.21 | 32.43 |
| Umtali Gaol ... | 8.78 | .45 | 53.93 | 30.58 |
| Victoria— | | | | |
| Bruceham e ... | 11.00 | ... | ... | 27.56 |
| Cambria ... | 8.48 | ... | 35.44 | 23.38 |
| Cheveden ... | 10.05 | .30 | 36.81 | 34.25 |
| Clipsham ... | 9.96 | ... | 40.87 | 27.22 |
| Gokomere ... | 7 69 | ... | ... | ... |
| Kimberley Ranch ... | 10.27 | ... | 44.25 | n.s. |
| Mashaba ... | 9.91 | .11 | 42.26 | 30.11 |
| Miltonia ... | 8.70 | ... | 33.91 | n.s. |
| Riverdene North ... | 9.39 | ... | ... | 26.04 |
| Silver Oaks ... | 9.71 | .05 | 38.55 | 28.35 |
| Stanmore ... | 6.14 | ... | 28.15 | 24.88 |
| Victoria ... | 7.98 | ... | 35.43 | 25.04 |
| Zimbabwe ... | 13.54 | ... | ... | 31.04 |

## RAINFALL—(*Continued*).

| Station. | 1929. March. | 1929. April. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone F.:** | | | | |
| Melsetter— | | | | |
| Chikore ... | 12.25 | .50 | 50.23 | 43.03 |
| Lettie Swan ... | ... | ... | ... | 43.53 |
| Melsetter ... | 12.02 | .43 | 62.57 | 44.13 |
| Mount Selinda ... | 17.34 | ... | ... | 58.46 |
| Vermont ... | 17.57 | .99 | 77.15 | 60.18 |
| Umtali— | | | | |
| Cloudlands ... | 14.78 | ... | ... | n.s. |

# Farming Calendar.

## June.

### BEE-KEEPING.

At this season hives require to be painted; the woodwork, being exceedingly dry, is in good condition to receive it. Linseed oil (unboiled) is the best kind to mix with white lead, as it is more penetrating, acting as a better preservative than boiled oil. Bees will be able to take beneficial flights during warm days, so that dysentery need not be anticipated.

### CITRUS FRUITS.

Cultivation of the grove is to be continued. Early ripening fruit must be harvested and marketed without delay. Mid-season varieties will be fit for packing early in the month. These should be shipped as early as possible, so as to extend the late variety export season as much as possible. Most late ripening varieties will require irrigating during the month.

A small amount of pruning should be done. If fumigation is to take place, remove the small branches that touch the ground, cut out all dead wood and water shoots.

### COTTON.

In cleaning up the cotton fields care will have to be exercised in the supervision of the pickers. The cotton harvested at this period of the season generally comes from late bolls naturally matured and those prematurely opened by the cold weather and frost. The matured seed cotton should be kept entirely separate from the immature seed cotton. There will also be some dirty and stained cotton in this final picking. Arrangements for next season's seed requirements should receive consideration.

### CROPS.

Select seed from the very best of your own crops. It is always wise to keep more seed than you may need for planting. Do not shell and ride your maize to the railway unless it is fit for export or market. If in doubt regarding the moisture content of the maize, send a 2 lb. sample in an air-tight tin, such as a golden syrup tin, to the Agricultural Department and have it tested. Provide ample dunnage for your maize stacked at the railway or on the farm. Use maize cobs; husks are almost useless for this purpose. Sew your bags of maize according to the export regulations and stack them properly at the railway side, leaving plenty of room between the double rows. Select pumpkin and melon seed from the best specimens. Support your agricultural show and make it a success by preparing and entering as many exhibits as you can. No one is more to blame for a poor show than the farmers themselves. Make a list of the seed requirements for next season, and where purchases must be made, place the orders early.

Veld fires must be anticipated, and if not already attended to, the mowing or burning of fire-guards, both boundary and internal, should be proceeded with.

## DAIRYING.

At this time of the year the farmer should experience very little difficulty in producing cream of first-grade quality. During the winter months the separator should be adjusted so as to deliver cream testing 40 to 45 per cent. butter fat.

On exceptionally cold days care should be taken that the milk is not allowed to become too cold before separation—for efficient skimming, the milk should be separated immediately after milking and at a temperature not lower than 90 degrees F.

Farmers engaged in butter-making are usually successful in obtaining a good grain and firm body in butter at this season of the year. During cold weather it is frequently necessary to warm the cream for churning. The most satisfactory method of warming the cream to the proper churning temperature is to place the bucket or receptacle containing the cream in a tub or bath of water at a temperature of about 95 degrees F., stir the cream frequently and replace the water when cold.

Under the cool conditions which obtain from this time of the year onwards, cheese-making operations are usually most successful.

Care should always be exercised, however, in using evening's milk. If the milk is over-acid it should not be used, or a hard, dry cheese will result. Morning's milk plus a starter usually gives the best quality of cheese. The starter should have a clean sour taste and smell. In early winter, milk for cheese-making frequently contains a high percentage of fat, and in order to firm the curd properly in the whey it is usually necessary to raise the scalding temperature a few degrees.

At this period of the year winter feeding of dairy stock should commence in real earnest. The milking cows should now be in fairly good condition, and in order to maintain a full flow of milk throughout the cold, dry months of winter, it is essential that liberal feeding be practised. As far as possible an attempt should be made to imitate summer conditions by feeding an abundance of succulent and palatable food. Maize silage, sweet potatoes, pumpkins, etc., are very useful for this purpose, but these feeds should be supplemented by dry roughage of good quality, preferably a legume hay, and a liberal allowance of mixed concentrates.

For dairy heifers, weaned calves, etc., there is possibly no better ration than one consisting of maize silage, legume hay and mixed concentrates, and these feeds, if supplied in liberal quantities, should serve to keep the young stock in a thrifty, growing condition.

## DECIDUOUS FRUITS.

General pruning may be done this month if the leaves have fallen. This should be confined, as far as possible, to the thinning out of diseased, weak, broken and dead shoots.

Tall trees may be reduced in height, and old and unprofitable trees headed back to induce the growth of new fruiting wood.

Trees that shed their leaves late may be pruned in July. The necessary preparations for planting trees should be completed during the month and planting commenced towards the end of the month.

Cultivation should be continued.

## ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during June.

Onions.—Suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

## FLOWER GARDEN.

Annuals for early spring flowering should be sown, preferably in paraffin tins cut lengthwise, in a place sheltered from the wind. Perennials, shrubs and ornamental tree seeds may also be sown. Fruit trees, shrubs and roses should be pruned and all dead wood removed. Sweet peas require constant attention.

## VEGETABLE GARDEN.

All the available space in the garden should now be thoroughly trenched and manured, the soil being well worked and loosened. Vegetables planted out for winter crops should be well and continuously cultivated, which will help to bring them along quicker and with less watering. Late-bearing tomatoes should be sheltered from the cold winds by a grass shield. Beet, radish, carrot, parsnip, turnip, onion, leek, mustard, cress and tomatoes may be planted.

## FORESTRY.

Care should be taken by further ploughing of land or burning of grass that all fireguards round plantations are in good order and effective. Thinnings where necessary may be continued, and fellings which are to be made are to be carried out. Cuttings may be taken and struck now of deciduous trees, such as the Carolina poplar. The pricking out of conifer seedlings into tins should be continued, and sowing of such seed for the coming planting season may be completed. A commencement may be made of preparation of land to be planted during the ensuing season, e.g., by stumping if necessary, and ploughing where practicable.

## GENERAL.

Grazing is deteriorating, and the next few months may be a period of difficulty for the rancher. It is a mistake, frequently seen, for all the grazing nearest to the drinking places to be first consumed, so that later on the cattle, when least able to endure fatigue and when the grass is in any case most scanty and dry, have furthest to walk from the feeding ground to water. A little forethought can obviate this trouble. Live stock are usually in good condition at this time of year and able to travel longer distances to water than may be the case later on in the season. Fire guards to prevent grass fires should be looked to.

## POULTRY.

The poultry keeper must be on the look-out for sudden cold snaps, for if some precautions are not taken, the production of eggs will drop. This was very noticeable at the end of last March and the beginning of April. Iron houses without a good thick layer of grass on the top and round the sides will be very cold at night for the birds, and not only will the egg output drop, but the birds will very likely contract congestion of the lungs, bronchitis or pneumonia.

Cold weather, too, is likely to affect the breeding stock and cause infertile eggs. A little extra crushed mealies added to the evening feed on cold days, or a little barley softened with hot water, will keep up the body heat of the birds.

This is one of the poultry keeper's busiest periods, but method, cleanliness and attention to details pay him well. Do not leave anything that you can spare the time to do yourself to natives. Watch carefully your breeding birds, and on the slightest sign of one going off, take him or her away; if left, you will have infertile eggs, weak germs, weak chicks difficult to rear, and later weak and unprofitable stock. See that the male bird has all the food he requires, and give him a meal by himself twice a week, also a small piece of raw meat three times a week. Those who are using incubators should watch the temperature of the room on cold nights, for variations in temperature result in delayed and poor hatches, and often deformed chicks.

## STOCK.

Cattle.—Where it is necessary to move cattle to fresh pasturage, this should not be unduly delayed. Cows with autumn calves should be kept in the more sheltered paddocks. A watchful eye should be kept on all watering places in order to prevent their being fouled or stopped up. Bulls should be kept out of the herd until the end of July at least, and, in the meantime, they should be well fed and cared for in order to fit them for their work. The three watchwords in the dairy herd should be feed, shelter and bedding from now onwards. Ensilage will now be found invaluable, as also will pumpkins, majordas or any other form of succulent food. Good hay should be used to rack up with at night, and the maize ration should be supplemented with ground nuts, ground nut cake or bean meal. Young calves are better in the pens on very cold mornings until the sun has gained some power, when they may run on short sweet veld for a few hours. The above remarks with regard to dipping and water supply apply equally to dairy as to ranching herds.

Sheep.—Sheep are best kept on the high veld for a while longer. If grass seeds are troublesome, a grazing area should be mown. If the rams were put into the flock in May, they should now be removed. Ewes with lambs will benefit by a few handfuls of mealies, and perhaps ensilage. They should be provided with shelter from cold winds.

## TOBACCO.

The grading of tobacco should be proceeded with. Any bales stored on the farm should be turned occasionally, especially where more than one bale is placed on another. Arrangements for the grading of tobacco seed should be made for the coming season. Growers purchasing tobacco seed should place orders early with distributors of reliable seed.

## VETERINARY.

Horse-sickness should be practically over now. Redwater and gall-sickness occur all the year round, but the worst time is the summer, when ticks are prevalent. Blue tongue should be very little in evidence now. Inoculation can be carried out now. Scab is a poverty winter disease.

## WEATHER.

Casual rains may occur, but except on the eastern frontier, none is to be reckoned upon, nor can it be regarded as seasonable or desirable. Frosts generally occur on a few nights during the month of June, and precautions must therefore be taken. This month and the next are the coldest of the year, and when the cold is accompanied by dull weather or "Scotch mist," known locally as "guti," it is apt to have a severe effect on live stock, especially if grazing should at the same time be scarce and water supplies far to travel to.

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# July.

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## BEE-KEEPING.

The warmer bees are kept during this month so much the stronger will they come out in the spring. Provide a thickness of 3 inches of cloth coverings over the frames, and where quilts are, on examination, found to be damp, replace them with dry ones. This is a favourable season to carry out repairs to hives. All section and shallow frame combs must be carefully stored away from ants and mice, as these will be wanted for the excellent honey to be stored in them next October, collected from the bush bloom.

## CITRUS FRUITS.

Mid-season oranges should be harvested and marketed this month; late varieties should be fit to export by the middle of the month. The dead wood should be broken and cut out of all harvested trees; this will minimise mechanical injury occurring with next season's fruit. Trees that are to be fumigated should have the lower lateral branches that touch the soil removed. Trim the trees until all foliage is just clear of the ground. The irrigation of late varieties must be continued and the cultivators kept going. Mark all trees when in fruit if the quality is bad; these may be cut back in August for top working to a good quality fruit. The soil of the early and mid-season varieties may be allowed to become fairly dry, for irrigation of the harvested trees may start an out-of-season growth which will enable pests to flourish and increase for the main spring blossoming flush.

## CROPS.

Support agricultural shows, and add to your list of exhibits. Advertise your goods through the shows. Interested people will see them. If you require to make purchases of seed for next season, judge by the exhibits on the show what grower can best supply your needs, and place your orders accordingly. Attend the shows and go there to learn all you can about your business, not merely to have a good time. Seed maize previously selected in the field should be butted and tipped and hand shelled. Keep the butt and tip grain for check-row planting by hand. Do not over-irrigate winter crops, and do not irrigate when the wind is from the south, as this often means frost at this time of year. Troublesome weeds, such as darnel grass or drabok, may be removed from cereal crops by hand. Ploughing should be pressed on with, and maize stalks and roots of maize and other trash from the crop should be collected and burned very thoroughly. A land littered with unburnt and unrotted stalks and roots cannot be brought to a suitable tilth for planting and subsequent cultivation. Silage and sweet potatoes and other succulent feeds will have come into general use now, the potatoes being lifted from the land as required. The application of phosphatic fertilisers which are to be ploughed or harrowed in can be begun. Take the opportunity, during this and the next month or two, of inspecting all boundary and paddock fencing and gates, and effect repairs where required. Give a coat of paint to implements, wagons and carts. This protects the woodwork from rotting and the iron from rust.

## DAIRYING.

This is one of the coldest months of the year, and milk production as a rule is low. Those cows which are being milked should receive a full winter ration of succulents (ensilage, pumpkins or majordas), hay and concentrates. Milking cows should either be under shelter at night or kraals should be sheltered against cold winds. The old adage, "Shelter is as good as a meal," should be remembered throughout the winter months.

No difficulty should be experienced in producing first-grade cream at this time. In cold, windy weather due precautions should be taken to ensure that the milk when separated is not below 90 degrees.

Most cheese-makers cease their cheese-making operations at the end of the month, as the milk generally not only is scarce, but begins to be deficient in butter fat. Cheese in the store-room should be carefully watched, as cheese mite is likely to appear on old mature cheese. In order to prevent the undue drying out of the cheese, the floor of the cheese room should be sprayed with water from a watering can.

Butter-making is sometimes difficult because of the low temperature of the cream. The temperature should be raised by immersing the can in warm (not hot) water until churning temperature is attained.

## DECIDUOUS FRUITS.

Pruning must be continued, and if possible completed this month. The planting of all varieties is best if done now. Add a liberal amount of water at planting time, then cultivate the basins. Sufficient moisture will be thus retained to keep the newly planted trees going until they start active growth. Repeat waterings when necessary. If trees arrive from the nurseryman in a dry and withered condition, immerse them in water for twelve or more hours until they regain turgidity; then plant. Running water is best. Keep cultivators going. It will be advisable to irrigate all trees towards the end of the month.

## ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during July.

Onions suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

Maize Beetle.—Infested lands to be thoroughly ploughed throughout the winter.

## FLOWER GARDEN.

Seeds of most annuals, perennials, shrubs and ornamental trees may be sown. The pruning of roses should be attended to early. Dahlias and other summer-flowering bulbs should be taken up, divided and replanted. Sweet peas require attention and staking.

## VEGETABLE GARDEN.

Sow turnips, beans, peas, onions, cabbage, beet, carrots, parsnips, radishes, lettuce and spinach.

## FORESTRY.

Care should be taken to protect all plantations from fire by hoeing belts round them and burning any grass likely to be dangerous. Cuttings of various deciduous trees may be taken and struck in nurseries. Continue pricking out conifers into tins or beds. In preparation for early planting in case the season is favourable, limited sowings of tree seeds may be carried out. If labour is available, preparation of land for planting to be taken in hand.

## GENERAL.

Veld fires must be watched for and arrangements made to combat them. The loss that may result and the penalties under the Herbage Preservation Ordinance are to be borne in mind. Fire guards should this month be burnt round all grazing which it is desired to preserve for use later on.

## POULTRY.

With the cold weather that we generally have in July, the birds should have extra food, i.e., barley or maize, if the supply of eggs is to be continued, for they need most of the food that previously went to manufacture eggs, to keep up the body heat. A mixture of stewed linseed and bran should be given to the birds, warm, the last thing before they go to roost. This gives them a little extra food during the long and cold hours of the night at this time of the year and maintains the body heat. A certain amount of shelter is also necessary to protect them from the cold winds. Grass wind breaks about 3 feet high on the windward side of the run are sufficient. Remember that no chickens should be hatched after August; those hatched later take much longer to develop than those hatched before August, and they are usually stunted, weakly and unprofitable. Each month the young stock should be gone through and graded;

anything that does not promise to be good should be got rid of. We want quality rather than quantity. As the hatching season draws to a close, the breeding stock, if not carefully watched and treated, will become run down, and infertile eggs and weak chicks will be the result. Watch the breeding stock carefully and handle them occasionally; if they feel thin and light or the flesh is not hard but flabby, give extra food and more scratching exercise. The male especially should be well looked after and given a meal on three or four days of each week by himself; in addition, he should have some raw meat as often as possible. Good hatching and strong, healthy chicks are wanted right up to the end.

Turkeys should now be in full lay. Never disturb the hens when they are sitting. They are very sensitive and nervous, and unless left mainly to themselves, are apt to desert the eggs or break them. It is recommended that turkey chicks be reared by hand; the hens are poor mothers, they are clumsy, drag their chicks all over the place, and do not feed them as well as an ordinary hen does. The main thing is to keep the young turkeys warm, give them plenty of fresh air, thick separated milk and chopped onions or onion tops.

## STOCK.

Cattle.—On ranches the advice given for June applies still. The bulls may again be put into the herd at the end of the month. If grazing has been reserved for the winter months, it will probably be wise to turn the cattle into it now. Watch for any unthrifty cattle, and get them into the home paddock and feed them before they become really poor.

Sheep.—Vleis should now be fairly dry and may be utilised; otherwise the advice given for June applies.

## VETERINARY.

Horse-sickness and blue tongue should now have disappeared. Redwater and gallsickness occur all the year round, but the worst time is during the summer, when ticks are prevalent. Sheep may be inoculated against blue tongue now. Scab in sheep will probably be in evidence this month.

## WEATHER.

Though rains have fallen during every month of the year in Rhodesia, none is looked for or desired this month. Most stations record an average of .01 to .3 inch over a number of years. Severe cold is likely to occur at this time of year, the lowest temperatures occurring an hour or two before sunrise. Frosts may be looked for, especially on calm clear nights. Cold windy days and damp "guti" weather tell severely on cattle, if shelter and food are not provided.

# Notes from the "Gazette."

| *"Gazette" Date.* | *Items.* |
|---|---|
| | AFRICAN COAST FEVER. |
| 3.5.29. | Government Notice No. 713 of 1928 is cancelled. The following farms in the Gwanda native district are released from all restrictions:—Essexvale Estate, Glen Lategan, Ballarat and Florencedale. (G.N. 276.) |
| | POUND. |
| 3.5.29. | A pound has been established on the farm Mooilaagte, as from 10th May, 1929. (G.N. 277.) |

# Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

## AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N Blackshaw, O.B.E., B.Sc., F.I.C.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 616. The Ground Nut or Monkey Nut, by C. Mainwaring.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.

No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.
No. 684. Warning to Maize Growers: Maize for Export.
No. 685. Notes on Farm Practices at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Orrdinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.
No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.
Botanical Specimens for Identification.
Maize Grading Regulations.

## REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.
No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.
No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.
No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.
No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.
No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.
No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.
No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.
No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.
No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H G. Mundy, F.L.S.
No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.
No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.
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No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.
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## Editorial.

***Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and subscriptions and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.***

**Farmers' Hall at Banket.**—The substantial and spacious building which is illustrated on the opposite page is the outcome of a co-operative effort by the farmers of the Banket area and is one which could well be emulated by farmers in other parts of the Colony. The farmers of the district, being convinced of the necessity for a hall, approached the Government with the object of obtaining a building site, with the result that a morgen of land was granted for the purpose. The funds required were raised by donations from local farmers, the local public and merchants of Salisbury, amounting to £500, while the balance was obtained by means of a loan from Government funds. The farmers themselves did all the work of construction under the direction of a local farmer possessing the necessary knowledge,

and the total cost was the modest figure of £1,200. Building operations were commenced in September, 1928, and the hall was completed at the end of April, 1929. As will be seen from the illustration, there is a spacious verandah at the front of the hall, while there is another at the back. The interior consists of a main hall 55 feet by 31 feet in extent, including the stage, and there are four rooms, one at each corner, 13 feet by 12 feet 6 inches. It has been suggested that one of the rooms should be placed at the disposal of the visiting doctor to be used as a consulting room. The hall is so situated and constructed that it could, if necessary, be used as a school.

The hall was officially opened by His Excellency the Governor on the 20th May in the presence of a numerous gathering of local residents and visitors from the capital.

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**Official Milk Recording.**—Provision has been made in the Estimates for the appointment of two official milk recorders, and Messrs. Fitt and Trenor, late District Agricultural Advisers, have been selected for these posts. Up to the present dairy farmers have kept their own private records, which have from time to time been published in this Journal, but these records have not been accepted as official by the various herd societies in South Africa. This difficulty will, however, now be removed. The importance of milk recording has been constantly stressed in these columns for many years past, and it is realised that the only means by which the abnormally low milk yield of the average cow in this Colony can be raised is by breeding from bulls the milk yields of whose dams are known and accepted as official. The milk recorders will not only perform the work of testing milk and of checking records, but they will give advice on all branches of dairy farming. It is to be hoped that their efforts will meet with the encouragement they fully deserve. Milk records will continue to be published in this Journal, but, of course, it is fully realised that some months must elapse before the scheme is in full swing, as it is intended to start official milk recording with newly calved cows. The old system will be continued until the

lactations of the present cows in test are completed, and the change over will be made under the new lactations.

Official Milk Recorder Fitt will be stationed in Salisbury, and Milk Recorder Trenor will be stationed in Bulawayo. It is anticipated that their time will be fully occupied, as the records of pedigree cows are only accepted as official by South African herd societies when the butter fat test for every thirty days of the lactation is extended over a period of forty-eight hours. Eventually it is hoped to extend the milk-recording scheme to cows other than pedigree, but this will depend, of course, on the support which is accorded to the scheme outlined above.

Forms of application have been sent out to most dairy farmers, but anyone who has been omitted can obtain full particulars as to the operation of the scheme from the Dairy Expert, Department of Agriculture, Salisbury.

**The Maintenance of Soil Fertility.**—Much has been written in this Journal on the evils of continuous cropping and the necessity for maintaining soil fertility by crop rotation. It is no exaggeration to say that some of the farm lands of this Colony have become so exhausted by the continuous growing of maize that they possess very little value to-day. The danger of robbing the soil in this manner has long been recognised by the Department of Agriculture, and much laborious and painstaking work has been done at the experiment stations with the express object of determining the best methods of counteracting the evil. As a result of this work a definite system of soil treatment has been evolved which has been proved beyond question to be economical and effective. This consists of growing green manure crops to be ploughed under and supplying farmyard manure or artificial fertilisers. Despite all that has been written and spoken on the subject, it will be observed from the report of the Chief Agriculturist for the year 1928 that the total acreage of green manure crops in that year was only 3,177 acres, which is less than one per cent. of the total area under crops. In commenting on this fact he writes:—

"Bearing in mind that green manuring, combined with the use of suitable artificial fertilisers, has proved, locally, a most effective and economical means of restoring soil fertility, the absurdly small proportion of the arable land planted each year to green manure crops is a matter of very serious moment. Maintenance of the fertility of the agricultural soils of a country is a matter of national importance. In the case of farmers working large areas of land, rotation of crop on any appreciable scale is restricted by limited outlets for the produce and by the small variety of cash crops which can be grown; available supplies of farm manure are entirely inadequate for the acreage annually under the plough. The only immediate and practical method of saving the soils of the Colony from the ruinous impoverishment now taking place lies in a wide adoption of the practice of green manuring, combined with the application of artificial fertilisers."

This is a very definite statement and one that cannot be ignored. We trust that it will be read by every farmer in the Colony and the necessity realised for immediate action.

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**Loans to Farmers for Conservation of Water.**—An amount of £10,000 has been provided by the Government this year for the purpose of granting loans to farmers to enable them to construct works for the conservation and utilisation of water to be used for irrigation and other purposes. In 1922 a sum of £5,000 was provided from Imperial loan funds for irrigation works only, but this was all expended in 1925, since which date no further moneys have been available. Regulations governing the granting of these new loans were published in the *Government Gazette* of the 7th June and are in accordance with the terms of the sections of the "Water Act, 1927," which provide for such loans. The scope of the present loan fund is broader than the former one, in that it enables money to be advanced for any water conservation work, irrespective of whether it is to be utilised for irrigation, for soil erosion prevention works or for sinking boreholes. Forms of application and the regulations governing these loans are obtainable from

the Irrigation Branch, Department of Agriculture. Certain particulars, as laid down in the regulations, regarding the proposed scheme must be furnished with each application. In the event of the amount of the loan requested being in excess of £500, more detailed particulars are required.

All applications for loans must be made on the prescribed form, and will be examined by the Government Irrigation Engineer or his representative, who will furnish a report to the Government as to the suitability of the proposed works. In respect of irrigation schemes, a further report by an officer of the Agricultural Department is required as to the suitability of the land which it is proposed to irrigate. In the case of a loan for boreholes, the application must be approved by the Minister of Agriculture and Lands. The granting of all loans must be authorised by the Governor-in-Council, by whom the interest payable and the period of redemption are fixed. The period of redemption for a loan under £500 is not to exceed fifteen years, and for a loan in excess of £500 thirty years, such period of redemption to be fixed to begin from a stated date, which must not be later than three years from the date on which the works were completed. The rate of interest is not to exceed a maximum of 8 per cent.

The security required for a loan is either a mortgage on the farm or two approved sureties who are holders of immovable property in Southern Rhodesia. If suitable security is not provided the Governor may cause a deed of hypothecation to be registered in the Deeds Office against the farm, as provided in section 83 of the "Water Act, 1927."

It is expected that there will be a considerable demand for advances from this new loan fund, and if wisely expended will undoubtedly materially improve conditions in certain areas where development is difficult under present conditions.

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**The Popularity of the Cigarette.**—Some idea of the extraordinary increase in popularity in recent years of the cigarette is gained by a perusal of an article in the American trade journal "Tobacco" of 25th April. In 1913, the per capita consumption of cigarettes in the United States was

137; in 1920 it was 399; and in 1928 it was 856. Expressed in another way, the number of cigarettes smoked in the United States in 1913 amounted to 13,247,891,437, while the total production was 15,570,798,437. In 1918 the consumption was 45,226,706,459, while the total production was 46,680,317,081 cigarettes. Finally, in 1928, consumption mounted to the enormous number of 102,764,698,000, while the total production amounted to the record of 105,926,765,651 cigarettes. It is considered to be probable that the American consumption of cigarettes in 1929 will approximate a nine-fold increase over the consumption in 1912. From what is written it would appear that exports of American-made cigarettes continue to expand in a very healthy manner. In 1928, the total number of cigarettes exported totalled 11,706,110,000, of which 8,639,128,000 went to China. It is observed that both the quantity and value of the annual cigarette exports from the United States have increased more than tenfold since 1913. Although Chinese companies are increasing their manufacture of cigarettes, it is considered that their products will never compete seriously with American cigarettes, for the reason that the prosperous Chinaman will continue indulging his taste for the latter. It is interesting to note that the remarkable increase in the consumption of cigarettes is attributed to publicity properly directed and continued.

France is by far the leading purchaser of American cigarettes in Europe, exceeding all other European countries combined. Shipments of American cigarettes to France increased 56 per cent. last year. Over 13,000,000,000 cigarettes were smoked in France in 1928, an increase of approximately 30 per cent. over the previous year. Sales of American cigarettes jumped from 150,000,000 in 1927 to 258,000,000 in 1928, a single brand of American cigarettes accounting for more than a quarter of this gain. The reason for the increasing popularity of the American cigarette is attributed to the new habit among the French people of smoking manufactured cigarettes instead of rolling their own. Moreover, French men and women have been complaining that the French tobacco monopoly purposely uses fast burning paper to make each cigarette last a shorter time and so speed up sales. A further claim for popularity is that Ameri-

can cigarettes are milder than the French, and frequently are treated by the toasting process to remove irritants.

In the same issue of the journal quoted are given figures of the cost of producing tobacco in Georgia, which in 1927 was the sixth largest tobacco producing State in America. It was found from a survey of 174 farms that the average total cost to produce an acre of tobacco was close to 100 dollars, or about 13 cents (6½d.) per pound, for a yield of 800 pounds per acre. In the Georgia survey it was found that yield per acre was the most outstanding factor which influenced cost and profits. Farmers with large yields invariably received a higher price per pound for their tobacco than those who had low yields. In most instances, however, large yields were obtained by experienced growers who had learned how to handle tobacco that had been highly fertilised. It is stated that the big demand for cigarettes is responsible for the great expansion in bright tobacco culture in Georgia.

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**The Poultry Industry.**—The growing importance of the poultry industry in this Colony has received further recognition by the Government in the provision this year of a substantial sum of money to be used for the inauguration and equipment of a Demonstration and Experiment Poultry Station. There is an urgent need for investigational work into such matters as breeding, incubating and feeding in their relation to our particular conditions, and an attempt will now be made to give a lead to poultry keepers in this respect. The matter of costs is an important factor in poultry rearing, and it will be one of the objects of the station to demonstrate economical methods of breeding and keeping poultry. It should be realised at the outset that there is no intention of entering into competition with poultry keepers in the marketing of eggs and poultry. The sole object of the station is to provide data which will help the poultry farmer in his business, and thus encourage and develop the industry as much as possible.

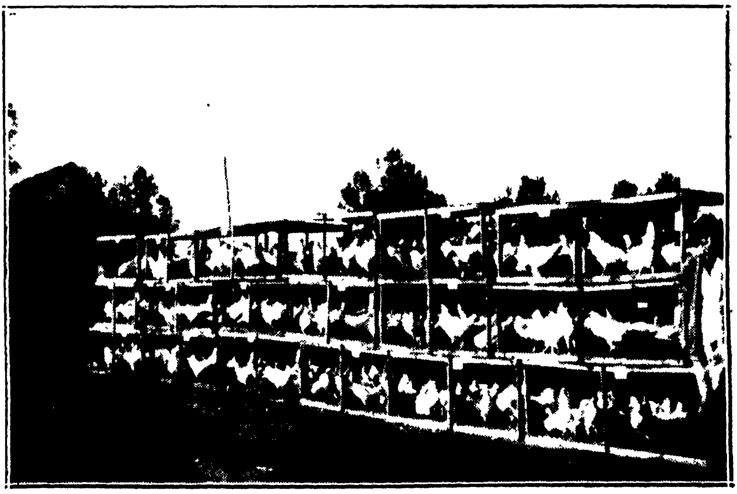
For the purpose set out above a site has been provided at the Agricultural Experiment Station, Salisbury, of approximately seven acres in extent. This area will be

systematically laid out and sub-divided to accommodate a semi-extensive breeding and commercial poultry plant and an extended egg-laying test. It is anticipated that a wide range of various breeds of poultry, including water fowl, will be kept for demonstration and experimental purposes. Single pens for the Southern Rhodesia egg-laying test are to be erected immediately in preparation for the 1930-31 test, which commences in March next year, and provision will be made for a maximum capacity of four hundred test birds. In the event of further extension being required in the future, provision has been made on this site to accommodate a maximum of one thousand birds.

Egg-laying tests have played no mean part in the development of the poultry industry of this Colony, and it is the policy of the Department of Agriculture to encourage them in every way possible. We have progressed from the time when these tests were regarded as laying tests and nothing more. They are now regarded rightly as the official means of testing potential breeding stock, and as such possess a value which it is difficult to assess. Another institution which is capable of exercising a big influence in raising the standard of poultry kept in this Colony is the register of pedigree birds, full details of which were given in the issue of this Journal for last January. We commend this register to the consideration of those breeders who have not so far participated in the scheme.

Although the poultry industry has made rapid strides in the past few years, there yet remains much to be done. We are still importing eggs to fulfil contracts in the north; there is still the seasonal scarcity of eggs and consequent high prices for a comparatively lengthy period of the year; while table birds of quality are difficult to obtain. The Government Poultry Advisers and those qualified to judge are unanimous in stating that Southern Rhodesia is a country *par excellence* for the successful rearing of poultry. There are in fact very few countries in the world possessing the natural advantages that are in evidence here. Is full advantage being taken of the opportunities? Until the defects mentioned above are remedied the answer must be in the negative. The Government has done a great deal to help the poultry industry, and it expects that poultry farmers

Some of the laying birds at the Glenville Stud Poultry Farm, Bulawayo. Between two and three thousand chickens are hatched on this farm each year.



A consignment of nearly five hundred laying hens sent to the Congo in April from the Glenville Stud Poultry Farm, Bulawayo.

will help themselves by applying approved methods and by the adoption of those principles which are essential for the successful conduct of any business.

We might add before concluding these remarks that it is the intention of the Department to station a Poultry Adviser at Bulawayo. We feel sure that this endeavour to help the poultry keepers in Matabeleland will be much appreciated by those concerned, and that the services of the officer will be freely utilised.

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**The Land Bank.**—The report of the Land and Agricultural Bank for Southern Rhodesia for the year 1928 states that the number of applications received for loans during the year was 443 for advances aggregating £321,072, as compared with 410 for £357,143 in 1927 and 324 for £342,986 in 1926. Sixty-two bonds were cancelled during the year, but in the majority of cases the cancellation was connected with the sale of the farm, and was accompanied by re-issue of the capital released to the new proprietor. The number of ordinary mortgage bonds registered during the year was 182 for advances aggregating £158,135, compared with 199 for £197,240 in 1927, and 180 for £202,738 in 1926. The decrease of £39,105 in the loans made in 1928, as compared with the previous year, falls under two headings, the purchase of land and the discharge of existing bonds, in which the decreases are £28,860 and £10,055 respectively. It is stated that the tobacco position is a reasonable explanation of the lessened demand for land purchase, while the annual decrease in the amount allotted to the discharge of existing bonds is the natural consequence, owing to the establishment of the Land Bank, of the gradual disappearance from the Colony of onerous bonds upon farms.

It is stated that the amendments of 1927 to the Land Bank Act permitted greater latitude in the financing of three very desirable farm developments, viz., dip tanks, fencing and boreholes. In 1926 the total amount advanced for dip tanks was £115, whereas over £800 was advanced for this purpose in each of the two succeeding years. In 1926 the loans for fencing amounted to £1,790, in 1927 to £6,203 and in 1928 to £6,615. As regards dip tanks and fencing, therefore,

farmers have appreciated and taken advantage of the increased facilities granted by the amendment of the Act. The same cannot be said regarding boreholes. With two successive years of low rainfall, entailing more or less severe drought conditions over large areas, the Board considers it would not have been surprising if there had been a number of applications for loans for boreholes. Yet only two loans for that specific purpose were issued over the period of the last two years. The explanation of this is that when a farmer considers the construction of a dip tank or a fence he can reckon within a pound or two what it is going to cost, but not so with a borehole. Therefore this uncertainty acts as a deterrent on borrowing, and compels him to trust to a less reliable water supply.

The following extract from the report should specially be noted by farmers:—

"In the majority of the farm valuations that come before the Board as much as two-thirds to three-fourths of the land is classified as grazing land. Reference to the stock carried on these farms brings out the fact that only in comparatively few instances is the grazing land being beneficially used, and, as a consequence, that the capital invested in that land is bringing in little or no return. The sum advanced by the Bank for stock purposes during the last three years averages less than £2,000 per annum. Making due allowance for the stock advances made by the Agricultural Department, there is still ample indication that many farmers in the agricultural areas do not realise the importance of including stock-keeping, either for dairying or beef, as part of their farming operations. Only by so doing can profitable use be made of the large proportion of grazing land found on most farms. It is generally accepted that such land in its natural state is not suitable for sheep, but after carrying cattle for a number of years, sheep will do well.

"By making full use of his grazing land, not only is the farmer deriving such profits as cattle afford, but he is preparing such land for carrying the much more profitable sheep. Although the Bank is allowed to

make advances against the value of the land and permanent improvements only, the facts that the whole farm is being beneficially used, and that the grazing land, by being well stocked, is a growing asset, are not without their influence in determining the value to be put on any farm.''

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**Pasture Improvement in Rhodesia.**—In our February issue we indicated that details would be published later of the research work on pasture improvement which was being undertaken by the Department of Agriculture in conjunction with the Empire Marketing Board.

The Government recently advertised for two field workers to carry out the practical work in these experiments, and from a large number of applicants Mr. H. O. Cazalet and Mr. M. F. Huddlestone, of the Department of Agriculture, have been selected to undergo a special course of training in this particular work at the Rowett Research Institute in Aberdeen. They left here in April last and are due to return in October next, when they will take charge, under the direction of the Chief Chemist, of the experiments, which will probably be carried out at the Matopo Farm and at the Farm Timaru situated on the Rhodes Inyanga Estate.

While no definite plan of experimental work has so far been drawn up, it is the intention of the Chief Chemist to lay down a series of paddocks which are to receive applications of various fertilisers. Some of these paddocks will be cut for hay and others will be kept grazed either by cattle or by sheep, the object being to determine the influence of the various fertiliser treatments on (a) the feeding value and mineral content of the grass as judged by chemical analysis, (b) on the botanical composition of the herbage, and (c) the influence of the various treatments of the grass on the rate of growth and productive capacity of the grazing animals. The actual experimental work will be started at the beginning of the next rainy season, and preliminary work such as the laying out of paddocks, erection of weighbridges, etc., is at present in progress.

Since reference was made to this matter in the Journal, the Chief Chemist has visited certain agricultural schools and colleges in the Union of South Africa for the purpose of ascertaining the work on pasture improvement which is in progress at these places, and also to establish contact with the various officers who are carrying out work on this subject. In a report which he has furnished to the Government he has placed on record his appreciation of the courtesy shown him by the administrative officers of the Union Department of Agriculture, by the various professional and technical officers at the schools and colleges of agriculture, and by the teaching staffs of the Transvaal and Stellenbosch Universities. At all these institutions every facility was given him to see the work that was going on, and to meet everybody who was or had been working on this subject. Although the actual work in progress on the problems associated with pasture improvement and veld management is very limited, and much of the work has only been commenced at a recent date, the information obtained will be of great assistance in drawing up the plan of work to be carried out in this Colony.

It is worthy of mention that one feature of the forthcoming meetings of the agricultural section of the British Association in Pretoria is to be a special conference on problems associated with the mineral content and improvement of natural pastures. The conference will be opened by Major Elliott, Parliamentary Under Secretary of State for Scotland, who will be followed by the Chief Chemist of the Department of Agriculture, Southern Rhodesia, who is representing the Rowett Institute, Aberdeen, and Dr. du Toit, Director of Veterinary Research of the Union of South Africa. Following the meetings of the British Association, the Pan-African Agricultural and Veterinary Conference will take place at Pretoria, and one of the subjects on the agenda is that of deficiency diseases, which will involve the problem of pasture improvement and mineral metabolism. These discussions should do much to stimulate investigational work on this subject, with which is so closely allied the progress of the live stock industry in South Africa.

The importance of this problem in Southern Rhodesia has been clearly emphasised by the Chief Chemist in an

article which he wrote for the *Agricultural Journal* of September, 1928, entitled "The Importance of Research on Pasture Improvement in Southern Rhodesia." It is interesting to note that since the publication of this article several farmers in different parts of the Colony have at their own expense instituted similar experiments on their farms, and letters have been received from them expressing their satisfaction at the results which have so far been obtained.

## NOTICE.

**Mr. G. W. Marshall, Government Horticulturist, has proceeded on vacation leave for five months dating from 24th June. It is understood that he has recently visited all farmers and new settlers particularly interested in fruit growing, and it is requested that written enquiries on horticultural matters will be postponed until his return.**

# Sunn Hemp

## (*CROTALARIA JUNCEA*).

By S. D. Timson, M.C., Dip.Agric.

Sunn hemp is a summer annual belonging to the natural order of plants—Leguminosæ. It is a tall, slender plant, slightly branched, with a strong, well-defined tap root, narrow lanceolate leaves and brilliant yellow flowers of normal leguminous type. In Rhodesia it produces nitro-bacterial root-nodules freely. Sunn hemp can withstand heavy continuous rains, so long as the soil is not water-logged, and is also resistant to severe drought, but is sensitive to frost. To commence with it is extremely rapid in growth, and within six to eight weeks will attain a height of three to four feet, finally reaching a height of four to eight feet in about ten to twelve weeks, depending on climatic and soil conditions. For the production of seed, however, a growing season of four and a half to five months is required. The plant is said to be indigenous to Southern Asia and particularly to India, and is said to have been grown largely in that country, from early historic times, for fibre and soil renovation.

Introduced into this Colony in 1912 by the Department of Agriculture, it has in the last few years gained great popularity as a green manure crop. Until the present season, Sunn hemp has proved to be free from attack by pests and diseases, but recently, for the first time in this Colony, a fungus disease causing a stem blight has been reported from one farm in the Mazoe Valley, to which reference is made later. Fortunately the disease does not threaten to be serious, as the fungus causing it, identified as a species of vermicularia, is only a weak parasite. A number of indigenous species of crotalaria grow wild in Southern Rhodesia, and some years ago the following species

were exhaustively tried out on the Agricultural Experiment Station, Salisbury, as green manure crops in comparison with Sunn hemp:—

Crotalaria intermedia.
Crotalaria maxillaris.
Crotalaria near maxillaris.
Crotalaria sphærocarpa.

The yields of maize following these crops were nearly the same in each case, Sunn hemp giving a slightly higher return; but since the seed of these native varieties is smaller and more difficult to harvest than that of Sunn hemp, they were discarded on this account in favour of the latter crop.

**Uses of the Crop.**—Sunn hemp is largely grown in India: (1) for fibre, and (2) for green manuring and smothering weeds, (3) as a green fodder and hay crop to some extent. In this Colony it is almost entirely grown as a green manuring crop, though experiments carried out by this Department have shown that it will produce fibre of good quality, though the yield is low. As a green manuring crop alone, Sunn hemp has no superior in Rhodesia, and certain of its characteristics give it distinct advantages over velvet beans and dolichos beans, the other two crops largely used for green manuring. These characteristics are as follows:—(1) Even when sown late, its rapidity of growth makes it possible to plough it under when the soil is still moist and before the end of the rains, so that rapid decomposition takes place before the next crop is sown; (2) it withstands both wet and dry conditions well; (3) it will grow satisfactorily on any type of soil which is not actually water-logged or infertile; (4) it is more easily ploughed under than velvet beans or dolichos beans, as it is of an upright habit of growth; (5) owing to the closeness of planting and the rapidity of its growth, it is an excellent crop for smothering weeds; (6) after planting it requires no further attention, whereas velvet and dolichos beans require several cultivations to keep weeds under control; (7) for all practical purposes it is at present free from attacks by pests and diseases.

In citrus culture in Southern Rhodesia Sunn hemp has given excellent results as a green manure and has proved itself superior to any other crop for this purpose. Compared

with dolichos and velvet beans, Sunn hemp offers the following special advantages:—

(1) It does not require cultivation subsequent to planting, and so the damage done by draught animals moving close to the trees is reduced.

(2) It does not climb up the trees, as do dolichos and velvet beans.

(3) Labour can move freely through a growing crop of Sunn hemp, whereas the runners of climbing crops such as velvet or dolichos beans considerably impede movement between the trees.

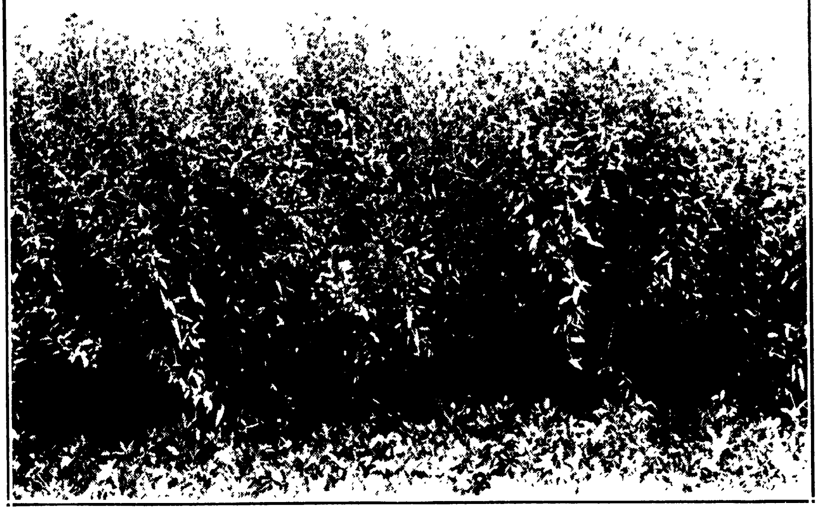
(4) It has not been found to be the host of any of the pests and diseases which attack citrus trees.

Sunn hemp may be grown successfully in a mixture with sunflowers, and this promises to be a useful system of planting for green manure in order to secure an even greater bulk of green material per acre. Where, as is usually the case in this Colony, the supply of farmyard manure is inadequate for the needs of the farm, a crop of Sunn hemp ploughed under can be used very successfully to maintain the supply of organic matter in the soil, which is so essential to the well-being of all crops, and particularly for a potato crop.

An experiment conducted at the Agricultural Experiment Station, Salisbury, demonstrates the value of Sunn hemp as a green manure crop. Six tons per acre of farmyard manure—a light dressing for potatoes—were applied to the land in the winter, and 200 lbs. per acre of bone and superphosphate were applied in the furrow at planting time. The following figures show the results obtained:—

| Previous treatment. | 1926-27. Yield per acre, bags. | 1925-26. Yield per acre, bags. | Average 2 years. Bags. |
|---|---|---|---|
| Sunn hemp ploughed under previous autumn ... ... ... | 93.0 | 87.7 | 90.4 |
| Oats and cowpeas; stubble only ploughed under previous autumn ... ... ... ... | 84.0 | 77.8 | 80.9 |

(Land on both plots received six tons per acre farmyard manure and 200 lbs. per acre bone and superphosphate.)



Sunn hemp, 8 feet high, at the Agricultural Experiment Station, Salisbury, 1929

On left, Sunn hemp alone; on right, Sunn hemp and sunflowers mixed. Agricultural Experiment Station, Salisbury, February, 1929.

It will be seen that an average increase in yield per acre of 9.5 bags of potatoes was obtained by ploughing in a crop of Sunn hemp.

Ploughing under the whole crop of Sunn hemp gives considerably greater yields from the following maize crop than ploughing under the stubble only. The following results demonstrate this point:—

| | Average 4 years. Bags maize per acre. |
|---|---|
| Maize after Sunn hemp; stubble ploughed under ... | 7.7 |
| Maize after Sunn hemp; whole crop ploughed under | 10.1 |

The standard weight of a bag of maize is 203 lbs. The above trials were carried out on the Agricultural Experiment Station, Salisbury.

**Suitability for Feeding.**—Sunn hemp is utilised in India for feeding green to milch cows, and also in the form of hay, but its value as a feeding stuff in this Colony is doubtful. When cattle have accidentally had access to a crop of Sunn hemp they have shown no great liking for the green fodder, but have eaten the dry leaves and pods and seeds without ill effects.

In a feeding test carried out at the Gwebi farm two Merino sheep were given quantities of the green crop of up to 2 lbs. per head per day. The animals showed no liking for the fodder, were only induced to eat it with difficulty and never consumed more than ¾ lb. per day. The green fodder is apparently not acutely poisonous, as these animals showed no ill effects throughout the sixteen weeks of the experiment. The feeding value of the seed for feeding to stock is still doubtful, and the present prices obtained for it (£2 10s. to £4 per bag of 200 lbs.) for sowing make it entirely out of the question to use it in this way. The evidence regarding its value as a feeding stuff is conflicting, and further work on this point is necessary before a definite opinion can be expressed. The following report on a sample of seed grown in Southern Rhodesia was supplied by the Imperial Institute, South Kensington, London:—

| | Per cent. |
|---|---|
| Moisture ... ... ... ... ... ... ... ... ... ... | 8.6 |
| Crude protein ... ... ... ... ... ... ... ... | 34.6 |
| Consisting of— | |
| True protein ... ... ... ... ... ... | 31.2 |
| Other nitrogenous substances | 3.4 |
| Fat ... ... ... ... ... ... ... ... ... ... ... ... | 4.3 |
| Starch, etc. (by difference) ... ... ... | 41.1 |
| Fibre ... ... ... ... ... ... ... ... ... ... ... ... | 8.1 |
| Ash ... ... ... ... ... ... ... ... ... ... ... ... | 3.3 |
| Nutrient ratio ... ... ... ... ... ... ... ... | 1: 1.5 |
| Food units ... ... ... ... ... ... ... ... ... | 138 |

"The seeds did not contain any cyanogenetic glucosides, but a substance was present which gave reactions similar to those of alkaloids, and it might therefore be dangerous to use the seed as a feeding stuff. The seeds of allied species of crotalaria, e.g., *C. retusa*, *C. sagittalis* and *C. striata*, contain an alkaloid which is probably cytisine, a highly toxic substance.

"Sunn hemp seeds contain a large percentage of proteins, but they do not appear to be generally used as a feeding stuff for cattle, although it has been stated that in some parts of India they are employed for this purpose."

The following analysis of Sunn hemp hay is given by de Sornay in "Green Manures and Manuring in the Tropics":—

| | Per cent. |
|---|---|
| Water ... ... ... ... ... ... ... ... ... ... ... | 14.39 |
| Ash ... ... ... ... ... ... ... ... ... ... ... ... | 9.94 |
| Cellulose ... ... ... ... ... ... ... ... ... ... | 27.39 |
| Fat ... ... ... ... ... ... ... ... ... ... ... ... | 1.12 |
| Non-nitrogenous matter ... ... ... ... ... | 32.85 |
| Nitrogenous matter ... ... ... ... ... ... ... | 14.31 |

There would appear to be no danger of accidental poisoning of stock by the growing of Sunn hemp on the farm, for this crop has been grown for many years in Rhodesia and no case of poisoning attributed to it has ever been recorded.

**Climate and Soil Requirements.**—Sunn hemp can be grown successfully on any type of soil which is not water-logged or definitely infertile, though it will, of course, make

its best growth on the richer soils, particularly on rich friable loams. It does not seem to like heavy clay soils. It matures more rapidly and yields a rather greater bulk in the warmer areas of this Colony and at the lower altitudes, but it has returned up to 17 tons of green material for ploughing under, with a rainfall of 22 inches, on the red soil of Salisbury, when the land was only in a very medium state of fertility. It will grow well on the granite sand soils of the Colony and even on the wet vleis until such time as they become water-logged. It also withstands drought to a marked degree.

Watt (Commercial Products of India) states, when grown as a fibre crop, "it requires a light and not necessarily a very rich soil. Experiments would seem to show that when cultivated on too rich soils the merit of the fibre deteriorates."

**Manuring.**—Though Sunn hemp, like any other green manure crop, is not generally manured or fertilised, it responds readily to treatment and, particularly, in this Colony, to applications of phosphatic fertilisers. It is probable that the most profitable system of fertilising maize lands or lands under green manuring, combined with the use of phosphatic fertilisers, will prove to be by applying the phosphate to the green manure crop. Experiments designed to investigate this point have been commenced at several of the experiment stations in the Colony. In particular it seems probable that applying rock phosphate to the land before planting Sunn hemp will prove the most beneficial and economical method of applying phosphatic fertilisers to the land. By this system 67 lbs. of phosphoric oxide is applied to the land per acre for every 200 lbs. of rock phosphate employed, as against only 39 lbs. of phosphoric oxide obtained from every 200 lbs. of superphosphate No. 1 used. The cost of this dressing of rock phosphate at present prices would be 13s. 6d. as against 14s. 2d. for the same dressing of superphosphate No. 1. The application of the rock phosphate increases the weight of vegetable matter to be ploughed under, thus benefiting the land directly in this way, and finally the ploughing under of the green manure crop and the large stimulation of bacterial activity resulting therefrom bring the bulk of the phosphate in the rock phosphate into a form readily available to the succeeding crop, and more rapidly than if the rock phosphate were applied direct to that crop, as the

availability of this fertiliser is relatively slow. As against this system, however, the farmer would receive no return in respect of the fertiliser applied for a matter of fifteen to eighteen months.

Research work at Pusa, in India, has shown that better yields of crops are obtained when inorganic phosphatic fertilisers are applied to the green manure crop than when applied direct to the succeeding crop, and it is thought that this is due to the fact that the inorganic phosphates in the fertiliser combining with the organic matter of the green manure crop to form organic phosphorous compounds, the phosphorus in the latter, under natural soil conditions, becomes more available to plants than when in the inorganic form.

In a series of field experiments in Bihar and Orissa, designed to test the effect of phosphates with and without green manure on rice grown on soils deficient in phosphate, it was found that phosphates produced only a small increase of rice both by themselves and when applied at the time of turning under the green manure. But when either superphosphate or basic superphosphate was applied at the time of sowing the green manure crop, an increase in yield of rice of about 45 per cent. was obtained.

Where the soil to be green manured with Sunn hemp is very impoverished or is naturally very infertile, as may be the case on the lighter sand soils of this country, it is advisable to give the hemp a dressing of phosphatic fertiliser, since the main object in green manuring is to produce as great a bulk of vegetation as possible for turning under. Further, as the green crop is helped to greater development above ground, so the root system will be developed to a greater extent below ground and more nitrogen from the air will be fixed by the organisms of the root nodules. The phosphates added to the soil before planting a leguminous crop, such as Sunn hemp, perform another important function by stimulating the nodule bacteria in the soil into passing quickly from the non-motile to the motile condition. As the bacteria can only invade the roots of legumes when in the motile condition, the addition of phosphates to the soil, if these are lacking, tends to accelerate the invasion of the roots of legumes by the nodule bacteria, and so their working life in symbiosis

with the legumes is lengthened and the amount of nitrogen fixed by them increased to the ultimate benefit of the succeeding crops.

**Preparation of the Land.**—Though Sunn hemp will thrive on land that has received poor preparation, yet increased yields are obtained with this as with other crops from proper attention being given to working the land to a reasonably fine seed bed. It should be remembered that once the crop is sown, no further working of the land can be done, and for that reason alone it is important to prepare the ground carefully before planting. Where the crop is to be sown "dry," *i.e.*, before the rains, the land should be reasonably clean, but where the crop is sown in moist soil this is not important, as the hemp makes such rapid growth that it will quickly overcome weeds. If required as a smother crop for weeds, it is therefore advisable to delay sowing until good rains have fallen.

**Planting.**—When grown for green manure, the crop is best sown fairly early in spring so as to ensure its being ready for ploughing under whilst the soil is still moist and more rain is due to fall and before the heavy work of reaping and ploughing other lands commences. This ensures that the mass of vegetation turned under will be well decomposed before the following crop is planted. This is a most important point with all green manuring in this Colony where a prolonged dry period intervenes between summer and the following spring. Where a farmer has a large acreage of maize to plant, dry planting may be considered as enabling him to finish the planting of the Sunn hemp before the time for planting maize arrives. If a farmer cannot plant the Sunn hemp early, yet he can still plant it later in the season after his maize crops are sown and obtain a full growth for ploughing under, owing to the short period it requires for growth; but in this case it may not be possible to plough under the crop whilst the soil is still as moist as, with advantage, it should be.

As a green manure and smother crop for weeds, a seeding rate of 40 lbs. to 50 lbs. per acre sown broadcast is suitable. If a lighter rate of seeding is used the crop will not act efficiently as a weed smotherer, nor will a maximum return of green manure be obtained for turning under. A better

and more even stand is obtained if the seed is broadcast with a seed barrow, especially if it follows a Cambridge type of roller which leaves the soil in small ridges, thus giving an effect almost equal to using a wheat drill. After broadcasting, the seed should be covered in with a disc harrow. A spike harrow does not cover the seed satisfactorily, as much of the seed is either left uncovered altogether or insufficiently covered. Drilling economises the seed, as less seed per acre is necessary to obtain a full stand of plants, owing to the fact that the seed is planted at an even depth and evenly distributed. This is important, as the price of Sunn hemp seed is still high and a considerable saving may be effected in this way. The seed may be sown by the ordinary cereal drill, where this is available, in which case a seeding rate of about 25 to 30 lbs. will be found sufficient. When grown for seed the crop is best drilled in rows about 15 to 20 inches apart, about 20 lbs. of seed being required per acre. The ordinary maize planter fitted with kaffir corn plates may be utilised for this purpose. The planter should be set to give double the spacing required between the rows, and the rows should then be "split" by going over the field a second time. Alternatively the field may be planted crosswise the second time, and a more even stand can sometimes be obtained in this way. The seed should not be planted more deeply than one to one and a half inches in moist soil, but should be planted rather more deeply when sown in dry soil.

Due consideration must always be given to the long growing period required for the production of seed, and crops raised for this purpose should usually be sown not later than the middle of December.

When grown for fibre, the seed must be sown more thickly still, and a seeding rate of about 60 to 80 or even 100 lbs. per acre is necessary to obtain straight, unbranched stems.

In India, when Sunn hemp is grown for seed it is customary to top the plants when they are about 2½ feet high. This is claimed to induce branching and the formation of a greater number of flowers, thus increasing the yield of seed per acre. Investigations on this point are in progress at the experiment stations in this Colony. Meanwhile it may be mentioned that the writer is aware of one progressive

maize farmer in the Mazoe Valley who has practised topping for some years. Last season his yield of Sunn hemp seed was six bags per acre, which can be considered unusually heavy for this Colony.

**Harvesting Seed.**—When the greater number of the seed pods are turning yellow the crop is cut, tied into bundles and stooked in the field. It is usually allowed to complete its ripening in the stook for a period of from fifteen to thirty days, and it is then carted to a threshing floor and threshed out by hand with "sticks" or by a machine, if such is available. In harvesting for seed it is good practice when cutting the crop to leave as long a stubble as possible, as this, when ploughed under, will materially benefit the soil.

In this Colony Sunn hemp is a somewhat fickle seeder, in some years giving an excellent yield of seed, while in other seasons, apparently similar as regards climatic conditions, its yield of seed is disappointing. An average return of seed is 400 to 800 lbs. per acre.

**Selection of Seed.**—The strain of Sunn hemp grown in this Colony is not pure, as it contains at least two different varieties—a tall and a dwarf variety. As the crop is grown entirely for its yield of green material for ploughing under, it is advisable to select the tall variety for seed, and by careful selection each year to eliminate the short variety.

**Ploughing under the Green Crop.**—Although the crop can be ploughed under at any stage of maturity, it becomes very woody when left to mature beyond the late flowering stage, and in consequence does not rot down in the soil so readily. It has been demonstrated at the Agricultural Experiment Station, Salisbury, that the best time to plough under Sunn hemp with a view to benefiting the soil for a succeeding crop is when the plants are in the late flowering stage, that is, when all the plants have flowered and a considerable number are in the full green pod. The following results of experiments carried out at the Station mentioned illustrate the fact that a mature crop of Sunn hemp, when ploughed under, exercises a greater beneficial effect on the soil than an immature crop:—

| | Yields in bags of maize per acre. | | | |
|---|---|---|---|---|
| | 1924-25. | 1925-26. | 1926-27. | Average 3 years. |
| Sunn hemp ploughed under in early flower ... ... ... | 8.2 | 19.8 | 7.25 | 11.7 |
| Sunn hemp ploughed under in late flowering or early green pod stage ... ... ... | 15.5 | 20.61 | 7.76 | 14.6 |
| After bare fallow ... ... ... | 2.5 | 15.9 | ... | 9.2 (2 years) |
| Seasonal rainfall in inches | 52.28 | 33.08 | 22.39 | ... |

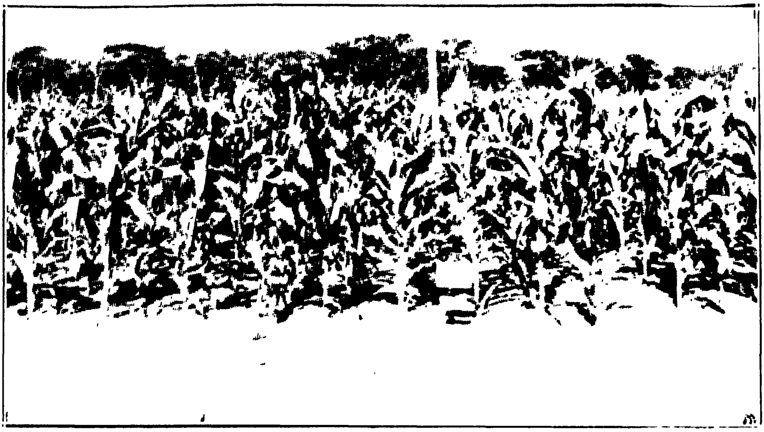
The greater effect shown by the mature crop in 1924-25 may be explained by the fact that the physical effect of the increased amount of organic matter ploughed under in a mature crop is emphasised in an excessively wet year more than in a year of more normal rainfall.

On the lighter soils the land may usually be rolled or disc harrowed with advantage after the ploughing under of the Sunn hemp. This compacts the soil, tends to prevent the soil drying out too rapidly, owing to the loose layer of vegetation lying between the soil and sub-soil, and assists the decay of the green mass of the crop. If the soil is comparatively dry when the crop is turned under there is a danger that vegetation will lie in the soil only partially decomposed through the long dry period of the winter, and that it may have a definite toxic action for a time on the crop planted in the following spring.

Being of an upright habit of growth, Sunn hemp is more easily turned under than are climbing legumes such as velvet, dolichos and kaffir beans, and there is no necessity for previously cutting it up by going over it with a disc harrow or for rolling it down. The trampling of the oxen or of the tractor presses the crop down in front of the plough and facilitates the work. The crop may be easily and well ploughed under if a mouldboard plough is employed fitted with disc-coulters. The disc-coulters give a clean-cut edge to the furrow slice and ensure clean work being done and keep the plough from being choked by the Sunn hemp. Good work is also done with a disc plough when properly set. The deeper the ploughing, within reason, the better the crop of Sunn hemp will be covered in. It should always be turned in as deeply as local conditions of sub-soil and the needs of

First series of rotation experiments. Maize grown for twelve years continuously on same land without manure. Agricultural Experiment Station, Salisbury, 11th February, 1925.

Maize and Sunn hemp on land previously cropped with maize without fertiliser or manure for fifteen years (1913-1928). In 1928-29 the land received 250 lbs. of bone and superphosphate per acre. The maize has not responded to the treatment, whereas the Sunn hemp shows good response. Nitrogen is probably the limiting factor. Photograph taken February, 1929, at the Agricultural Experiment Station, Salisbury.



Maize following Sunn hemp ploughed under when in full green pod
Agricultural Experiment Station, Salisbury, 9th February, 1925.

Maize following Sunn hemp ploughed under when in first flower.
Agricultural Experiment Station, Salisbury, 8th February, 1925.

the following crop will allow. If the soil is moist when the crop is ploughed under and is not left in too loose a condition, the mass of vegetation will be rotted down in about six weeks, and the land should then be cross-ploughed to distribute the organic matter thoroughly through the soil. This second ploughing of the land is always essential if the best results are to be obtained from a green manuring, and it can generally best be carried out two to three months after the turning under of the green crop.

**Cost of Green Manuring.**—The chief item in the cost of green manuring with Sunn hemp is the cost of seed, which at present is very high. The farmer should therefore grow his own seed each year. When the crop is grown for seed one 200-lb. bag of Sunn hemp will plant about ten to twelve acres if drilled at fifteen to twenty inches between the rows, and an average yield of seed being about three bags per acre, some 30 to 36 bags of seed should be obtained from the one bag planted, which is sufficient to sow about 120 to 144 acres of land for green manuring (at 50 lbs. seed per acre) the following season. Where the seed is home grown the cost of green manuring one acre of land with Sunn hemp is about 12s. 6d. to 15s. per acre.

*Fertilising Constituents of the Sunn Hemp.*

| | Weight of crop per acre. | | | In dry matter. | | | Lbs per acre in crop above ground. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Dry matter. | Water. | Total. | Nitrogen. | Phos. acid. | Potash. | Nitrogen. | Phos. acid. | Potash. |
| | Lbs. | Lbs. | Lbs. | Per cent. | Per cent. | Per cent. | Lbs. | Lbs. | Lbs. |
| Sunn hemp | 9,119 | 10,225 | 19,344 | 2.306 | .257 | 1.262 | 210.2 | 23.4 | 115.1 |
| Cow pea ... | 3,962 | 9,718 | 13,680 | 3.788 | .642 | 4.064 | 150.0 | 25.4 | 161.0 |
| Velvet bean | 6,390 | 7,026 | 13,416 | 2.998 | .470 | 1.696 | 191.5 | 30.0 | 108.4 |

The above table shows the weight and fertilising constituents in green manure crops ploughed under in a series of experiments carried out on the Agricultural Experiment Station, Salisbury. The analyses quoted were made by the Chief Chemist, Department of Agriculture.

**Harvesting and Treatment of a Fibre Crop.**—The crop is usually harvested when in green pod, and sometimes later when the seed is required as well as fibre. The plants are

pulled up by the roots or cut with the sickle. When grown as a dual-purpose crop the plants are cut at ground level, and the green tops are also cut off to be ploughed in with the stubble to form green manure. After cutting or pulling, the plants are left to wither for a few days. The leaves are then stripped off and the plants tied in bundles of about 100 stems, which are small enough to be easily handled. These bundles are stooked and left until dry. When ready, the bundles are placed in water and weighted down to keep them below water, and left to ret for about five days in hot weather or up to eight or nine days in cool weather. After retting, the outer bark is stripped off and the bundles are beaten on a stone with a stick and then threshed on the water to remove the resinous substances and clean the fibre. This process may have to be repeated several times before the fibre is properly clean. Finally the hanks of fibre are wrung out and hung up in the sun to dry and bleach, after which they are combed to clean the fibre of particles of bark and other rubbish.

In India 200 to 1,200 lbs. of fibre are said to be obtained per acre, with an average yield of about 600 lbs. per acre.

**Uses of the Fibre.**—The fibre is used in India largely for the making of fishing nets, but it is suitable for all purposes to which true hemp is put, particularly for the manufacture of cordage and canvas, the tow going to the paper mills. The value of the fibre on the English market is not high, and difficulties are met with in this Colony in the preparation of the fibre, owing to the fact that the natives are not skilled in such work.

The best yield obtained on the Experiment Stations of this Department is only 300 to 400 lbs. per acre of clean fibre. Sunn hemp fibre has not been produced commercially in Rhodesia up to the present time, and for this reason the Department of Agriculture is not in a position to recommend the crop for this purpose.

**Pests and Diseases.**—Sunn hemp has proved to be remarkably free from pests and diseases since its introduction into this Colony seventeen years ago. In fact, until this present year, no disease affecting the plant has been notified. This season a stem blight of the plant has been noted on one farm in the Concession area, and the causative agent

has been identified by the Government Mycologist as being a species of a fungus named vermicularia. This disease attacks the stem usually from four to eighteen inches above the ground, the tissue turns black and the plant is finally killed. This species of vermicularia is closely allied to *V. capsici*, reported from India on other legumes, but differing from it in the size of the spores. It is a weak parasite and is not likely to cause any serious damage to Sunn hemp crops. A certain amount of damage to the leaves of Sunn hemp has been done by a species of Ootheca beetle on the Agricultural Experiment Station, Salisbury, but this is not serious and the writer has never noticed any damage of importance by these beetles on Sunn hemp crops in the field.

## SUMMARY.

(1) Sunn hemp is a very valuable green manure crop, and amongst crops grown for that purpose alone in this country holds a pre-eminent position owing to the following characteristics:—

(a) It requires only a short growing season of three and a half to four months.

(b) It can be grown on any soil not definitely infertile or water-logged.

(c) It requires no cultivation after planting.

(d) When sown at the rate of 40 lbs. of seed or more per acre it is an excellent smothering crop for weeds.

(e) It withstands well both drought and excessively wet conditions so long as the soil is not water-logged.

(f) It is almost entirely free from pests and diseases.

(g) It is much more easily ploughed under than other legumes having a climbing or trailing habit, and in this respect presents no difficulty.

(h) Whereas other legumes have on occasions given negative results with a following crop, this has never been reported in the case of Sunn hemp.

(2) Sunn hemp yields a large bulk of green matter for ploughing under.

(3) It produces a fibre of good quality, but the yield per acre is low.

(4) It can be used as a dual-purpose crop, as, when grown for fibre, the tops and stubble can be ploughed under as green manure.

(5) It can be used for under-planting maize and ploughing under after the maize is reaped.

(6) It appears to be harmless to stock.

(7) Its value as a stock feed is doubtful. It is not palatable to cattle.

(8) It is sensitive to frost.

(9) It responds readily to applications of phosphatic fertilisers.

(10) It is best planted just before or with the first rains in November, as it is then ready to plough under when the soil is still moist. It may, however, be planted as late as February, though a full growth may not then be obtained.

(11) At least 40 lbs. per acre of seed should be sown for a green manure crop.

(12) It matures for ploughing under in three and a half to four months.

(13) It is best ploughed under when in the early green pod or late flowering stage.

(14) It is readily ploughed under without previous rolling or disc harrowing.

(15) It has been repeatedly demonstrated that Sunn hemp is an excellent green manuring crop, to be followed by maize and potatoes, in all parts of the Colony.

(16) Sunn hemp has proved itself to be the most suitable green manure for citrus plantations in Southern Rhodesia.

# Farm Forest Practice in Southern Rhodesia.

Issued by the Forest Service.

## IV. TENDING AND CARE OF YOUNG PLANTATIONS.

The labours of the tree grower have by no means ceased when he has finally set out all his plants into their permanent sites. He must be prepared to carry out several operations in his plantations, if his trees are to achieve the end desired. No matter what the ultimate object of planting may be, a certain amount of fostering is necessary, especially in the drier Savannah zones, where the establishing of trees is at no time an easy task.

**Filling Blanks.**—It seldom happens, even though the very greatest care has been exercised, that there is a complete survival of all the plants originally set out in any given plantation. As soon as the young trees, collectively, show signs of having "taken," the plantation should be gone through thoroughly, and fresh plants set out wherever "misses" have occurred. It follows that a reserve supply of plants should always be on hand for this purpose.

The filling of blanks may be carried out over a period of several years, until the plantation is fully stocked. Even though many of the later planted trees may never reach a large size, they will be serving the very important function of protecting the soil. In a naturally grown forest, trees of all sizes and ages are found together. Each serves its own particular purpose, and if it proves to be superfluous or unhealthy, nature will soon discard it. In a plantation set out with the prescribed planting distances, no tree should be superfluous until after several years. Nature will then indicate which should be removed.

The filling of blanks in a young wood which has been raised from seed sown *in situ* should ordinarily be carried out during the following planting season. The operation is greatly facilitated by the fact that young seedlings may be removed from spots where several have germinated together to those which show failures. The simplest method of transplanting such seedlings is to dig out with a spade a suitable section, which may have one or more seedlings. A hole is prepared sufficiently large to receive the section which carries the seedlings. This is inserted and firmly tamped to secure proper contact with the mother earth. If the section is cut sufficiently deep the young seedlings should carry on with their growth as if they had never been removed from their original sites.

**Nature abhors a vacuum. If you don't fill the blanks, the weeds will.**

**Cultivation and Weeding.**—It has often been observed that the importance of this combined operation is lost sight of by some tree planters, who consider that, once their trees are planted, they should be left to fend for themselves.

Natural forests take many years of extraordinarily careful preparation of new ground before they can spread over wider areas. The process is only completed after several painstaking attempts, and at the sacrifice of many seedlings. Man seeks artificially to establish a new forest in a new environment in one operation. It will, therefore, readily be realised that if he is to carry out the operation more quickly than nature, he must give his young trees suitable growing conditions by artificial means.

The objects of cultivation and weeding are to obtain a soil mulch for the conservation of water, and to minimise the competition of weed growth, both for water supplies and light. The weed growth may be grass, herbs, shrubs or even trees. Any implement which will kill their growing activities may be employed. The operation should start as soon as the green tinge of new weed growth appears. The ordinary farm cultivator drawn by some draught animal is

an excellent implement where it can be used. Often, however, the cultivation is left until the ground becomes so hard that a cultivator merely skims the surface. The hoe, spade or shovel should then be resorted to. The cultivation and the weeding should be complete over the whole area. If it is found impossible to carry this out, the operation should be confined round each tree to a radius of two feet or more. The killed weed growth should not be removed, but left on the ground to rot. The rotting material will act as a mulch and finally decompose into plant food.

On steep hillsides where erosion might be feared, or in localities of high rainfall, cultivation should be reduced to a minimum, and weeding should take the form of slashing down, but not cutting out, all undesirable growth.

The operation of cultivating and weeding should be carried out at least once a year, and again every year until the young plantation forms a canopy sufficient to suppress the weed growth. The incidence of weeds and also of rainfall are the factors which naturally determine the frequency of the operation. It follows that the greater the encouragement given to the trees to grow the sooner will the necessity of weeding and cultivation cease. The period with a plantation of fast growing eucalypts may be only two years; with pine, cypress and callitris species three to five years may be necessary.

The advisability, suggested in the preceding article, of planting late in the rainy season has the additional recommendation that the current year's weed growth has spent most of its vitality and will offer little competition to the newly planted trees.

In cultivating near the young trees it is important to guard against the native practice of heaping soil round the base of the stems. In the same way as a seedling or a transplant should not be inserted into the soil with the collar submerged, so should the heaping of earth round the stem of a growing tree be avoided. If the lenticels—minute channels in the bark—are choked, the normal flow of food to the roots is checked and the tree becomes unhealthy and finally succumbs.

**Why grow weeds where trees can grow?**

**Pruning, Cleaning and Thinning.**—These operations, which in themselves are simple and straightforward, have, through the misunderstanding of tree planting tyros, led to the ruining of many otherwise beautiful plantations. There are many who consider, as soon as a young plantation begins to make itself conspicuous on the landscape, that it needs a rigorous treatment of pruning of side branches or a thinning out of every alternate tree. No greater forest fallacy exists.

Trees grown in close type formation for timber are originally set out in accordance with a planting distance which will ensure their forming canopy in the shortest time, provided that they do not result in spindly, whippy stems. The objects of this canopy are to exclude light from the soil and form the lower portions of the trees. As sunlight is essential to the growth of most forms of vegetation, the exclusion of it will keep out weed growth. As sunlight also means heat, the exclusion of it from the forest floor means a cooler atmosphere, the retardation of evaporation and the conservation of moisture in the soil. As each tier of branches knits together with the corresponding tiers of adjacent trees, it follows that light is excluded from the lower tiers. In time this results in their dying off naturally. While, however, these side branches are living they are functioning in the very important capacity of manufacturing food for the roots and other parts of the tree, in addition to the shade they give to the soil. The injury which results in the removal of these side branches before their time is therefore obvious. The injury extends not only to the plantation as a whole, but to the pocket of the plantation owner, in that he is wasting time, labour and money. Nevertheless, even in the best regulated plantations, there will always be trees which are abnormally developed. This abnormality may be expressed either in one or more stems of the tree or in extra large side branches. The use of the knife or billhook is now justified. Trees should be pruned to a single stem, and the abnormal side branches cut back to such an extent that subsequent growth will tend to be concentrated more in the leading shoot.

The operation of cleaning is really a light thinning soon after the plantation has formed canopy. Only such trees as are diseased, or, being crooked or otherwise badly shaped, are interfering with the growth of good trees, should be removed. The diseased trees should be taken out of the plantation and burnt. The smaller branches of the other extracted trees should be lopped off and left to rot on the ground and the timber if possible utilised.

Thinnings are carried out on the same principle. In every plantation there are trees which are "dominant," "dominated," "suppressed" and sometimes "diseased." The "diseased" trees should always be taken out first. The "suppressed" trees should then follow. They are trees which have fallen so far behind in competition with their neighbours that they are merely encumbering the ground. These two classes of trees may be removed at any time without injury to the forest as a whole.

With the next class, the "dominated," care and thought must be exercised before they are removed. In the first place *they should only be removed if they can be utilised.* The "dominated" trees are those which are healthy and growing, but which are nevertheless topped or being crowded out by their more fortunate brethren, the "dominants." Before cutting out a "dominated" tree, it is essential to visualise what effect its removal will have on the remaining trees. The crowns of the trees will indicate where thinnings may be undertaken. If a distinct gap in the canopy will result in the introduction of light to the soil, then the tree must be left standing. This applies also to the tree which, even though crooked and unutilisable, is still keeping the forest canopy intact.

It is manifest that bad thinning will seriously retard the increment capacity of the remaining crop. The marking of trees to be thinned should remain with the European who understands the work. It should never be left to the unskilled native labourer.

**Don't waste money on unnecessary thinnings.
Put it into more trees.**

**Protection.**—This vital matter of protecting the forest from its greatest enemies—man, animals, insects and natural causes—has been left to the last, because upon it hinges the very life of the forest, from the beginning when the first tree is planted to the end when the final tree is felled.

Protection against man directly is a simple matter, merely by limiting trespass within the forest. Indirectly man may be the primary cause of the forest's greatest menace—fire, which will be discussed later.

Protection against insects is a subject which cannot be dealt with at length in this article. Serious destruction is only brought about when an invasion of a particular pest occurs. Up to the present time there have been no harmful raids on exotic plantations in this Colony, and it is therefore impossible to detail specific protective measures. The natural enemies of insects are birds, and it behoves the tree grower to give sanctuary at all times to these friends.

In the young stages of a plantation animals may cause serious damage to the trees, in particular domestic cattle and goats. The plantations should therefore be adequately fenced to exclude these animals until such time as the trees have reached a size which renders them immune. Destruction by small game and spring hares may be prevented by shooting, trapping, gassing and, in the event of their failure, the erection of simple brushwood guards round each tree.

In some localities field rats have been noted to have caused damage to young trees, particularly cypress species. The pest occurs only in abundance where it can obtain the shelter of thick undergrowth. Severe weeding of this undergrowth is the remedy to apply, and this may be augmented by poison bait. Owls and hawks, which take a great toll among rats, should not be discouraged.

As indicated above, the worst enemy of the forest is fire. The damage it causes is not only confined to the burning of the trees themselves, but to the almost complete destruction of the valuable organic matter on the forest floor. At the end of every rainy season adequate fireguards should always be prepared round all the plantations. In some localities a ploughed strip, ten to fifteen feet wide, may be sufficient. In others two control lines a few feet wide and

twenty to thirty yards apart should be prepared and the intervening strip burnt. Control burning is most safely carried out at night when the air is still. The inflammability of the growth adjacent to the plantations and the prevalence of high winds are the factors which determine the width of the fireguards. If possible the outer boundaries of the plantations should be planted with fast-growing species with dense foliage and rough bark which do not burn easily, such as *Eucalyptus microcorys*, *Euc. paniculata* and *Euc. botryoides*. Such trees have a dual beneficial effect, in that they shade the ground and keep down weed growth, and with their tall dense crowns they tend to arrest sparks which may be borne from a fire in the vicinity.

In a young plantation which has not yet formed canopy, the keeping down of weed growth already advocated will be of great assistance in lessening the damage in the event of a fire arising within its boundaries.

**A growing plantation is like paper money—no good when it's burnt!**

# A Farmers' Day at Chipoli, Shamva.

An interesting gathering of farmers and officials of the Department of Agriculture took place at Chipoli farm, Shamva, the property of Captain J. M. Moubray, on the 4th June. Captain Moubray had kindly invited members of the Department and representatives of the farmers from various parts of Mashonaland to visit Chipoli and see the work in progress there and the methods of arable farming which he is following. The visitors for the most part arrived about 10 a.m., and after morning tea left by car on a tour of the estate. The first section visited was the maize competition plots. The control plot of two acres had been harvested

and shelled a few days previously, and the yield recorded was the satisfactory one of just on 59 bags, or 29½ bags per acre. The competition plot was to be harvested the next day, and the visitors were invited to enter for a sweepstake and guess the yield per acre from the plot. The field in which these plots were situated had been treated in previous years as follows:—In 1926-7 a green manure crop of dolichos beans, to which about 150 lbs. of rock phosphate had been applied, was ploughed under. In 1927-8 fire-cured tobacco was grown with an application of artificial fertilisers supplying nitrogen and phosphates, but no potash. In 1928-9 the whole field was dressed with about one ton per acre of wood-ash and compound sweepings. This is the history of the control plot and the balance of the field, excluding the competition plot, which in addition this season received 300 lbs. of high grade superphosphate.

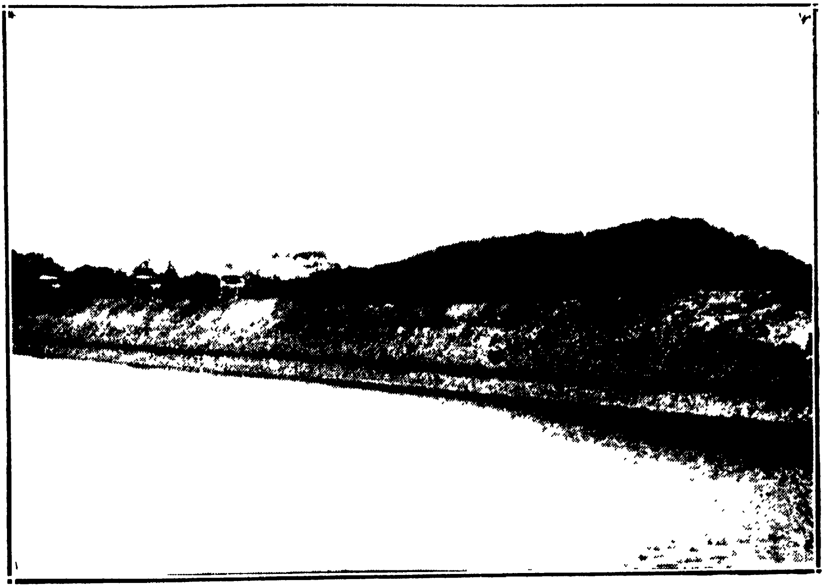
We have since heard that when the competition plot was harvested and shelled on the 5th June the yield recorded was 28½ bags per acre, or one bag an acre less than that of the control. It is difficult to account for this falling off in yield, but a possible explanation lies in the fact that while there was a sufficiency of nitrogen and phosphates in the soil there was an insufficiency of potash.

At the same place attention was drawn to the methods employed to check soil erosion. The land here lies on a steep slope, and due to frequent cropping with maize, coupled with the soil erosion which was taking place, the yield of this land was reduced until a few years ago to an average of about seven bags per acre. By prevention of erosion and by working up the land by green manuring and use of fertilisers, the average yield over the whole field—46 acres—this year is estimated to exceed 20 bags an acre. A system of storm water drains and banks has been put through the field at intervals of about 120 yards, and it was obvious that these were proving most effective, not only in checking erosion, but also in causing the lower sides of each section gradually to silt up to a more uniform level with the rest of the field.

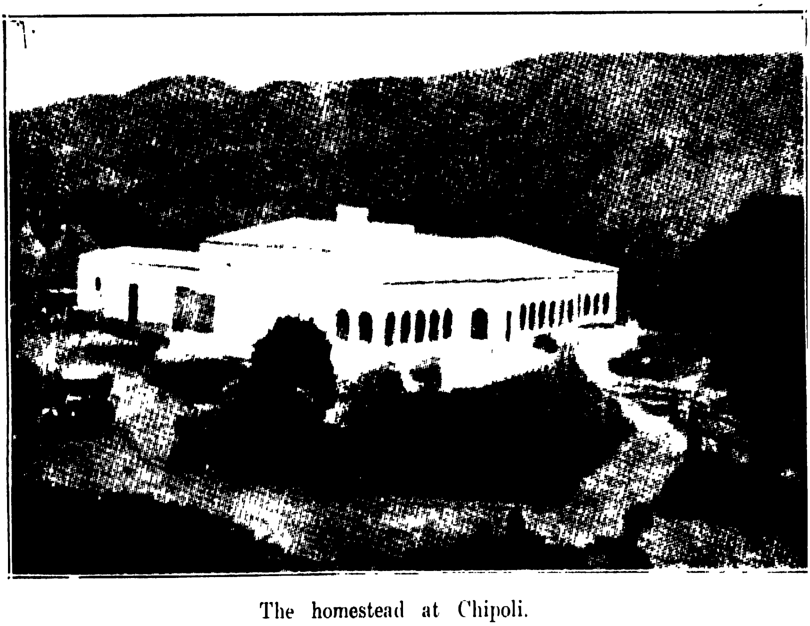
From this point the cars wended their way through the farm, passing one of the citrus groves, where very fine crops of fruit were in evidence. Sunn hemp eight to nine feet in

Farmers' Day at Chipoli, Shamva. Visitors standing on the fifty-nine bags of maize reaped from the competition plot of two acres. Captain Moubray in foreground.

Farmers' Day at Chipoli, Shamva. A field of U. 4 cotton.



Farmers' Day at Chipoli, Shamva. Cars crossing the dam wall.



The homestead at Chipoli.

height had been ploughed under throughout the groves, and Captain Moubray explained that while it was easy to plough under the Sunn hemp between the rows running in one direction of the grove while the crop was still young and green, it was necessary to leave for another month at least the green manure crop standing between the trees in the rows running in the opposite direction, otherwise that part which had been already turned under would be at once brought to the surface again when the plough operated across the groves. The turning under of this older Sunn hemp had been found difficult and a great part of it still remained on the surface uncovered by the plough; this, however, was not a serious disadvantage, for it was found that the irrigation water could be turned right over the whole grove without the use of leading furrows, and the unrotted Sunn hemp on the top of the ground checked the erosion of surface soil which otherwise invariably took place.

Passing on from here, the next field visited was one of maize, which was green manured last season, with an application of between 200 and 300 lbs. per acre of rock phosphates to the green manure crop—dolichos beans. The yield on this field had previously fallen to about nine bags an acre, but when inspected, the visitors saw a crop of maize which would yield at least 75 per cent. more, or in the region of 16 to 18 bags an acre. Captain Moubray emphasised that this improvement in fertility had been effected by the turning in of one green manure crop to which a reasonable dressing of rock phosphates had been given. The upper portion of this land was protected by a system of storm water drains, but one strip had not been so protected, since the drain had not been completed until towards the end of the recent rainy season. On the latter area erosion of the surface soil had taken place, and an excellent object lesson was to be gained from the fact that where the erosion had been checked green manuring, as stated above, had proved of full value; but where the erosion had not been prevented during the past season the crop was very distinctly inferior, and it was evident that the green manuring had not been nearly so effective.

Passing on from here, a field of U. 4 cotton was next inspected. The land was of comparatively low fertility, but

the plants had made fair growth and were showing a wealth of bolls, and these were opening up in a very satisfactory manner. Major Cameron, the cotton specialist, gave a short address on cotton cultivation and explained what was being done at the Cotton Breeding Station, Gatooma, and the improvement which he and his assistants hoped to effect in the existing strain of U. 4 cotton during the next few years. He uttered a note of warning against farmers plunging into cotton again on a large scale before the success of U. 4 had been very definitely proved, and subsequently explained what arrangement he proposed to make for the issue of seed for the forthcoming season.

The return journey to the homestead was now commenced and was taken *via* one of Captain Moubray's dams, the cars having to pass over the dam wall, which only left a space of about nine to twelve inches on either side of the wheels. Some of the less adventurous spirits decided to return by the road previously taken, but a number of guests essayed the passage of the dam wall and were rewarded by a fine view of the entire property when traversing what Captain Moubray terms his scenic route.

The homestead was reached about lunch time, when an excellent repast was provided by Mrs. Moubray, to whom, with Captain Moubray, the visitors later in the afternoon expressed their most cordial thanks for a delightful and instructive day.

The party, which had now been reinforced by a number of late arrivals, next proceeded to the citrus packing house and the tobacco curing barns. The methods of curing and handling fire-cured tobacco at Chipoli were here thoroughly explained, after which those present listened to short addresses from members of the Department of Agriculture, the officials present being the Chief Agriculturist, the Horticulturist, the Chief Tobacco Expert, the Chief Chemist, the Cotton Specialist and Mr. Sinclair, the Chief Veterinary Surgeon.

Captain Moubray is practising mixed farming in its fullest form. His principal crops are fire-cured tobacco, citrus fruits—of which 6,500 cases were exported last year—maize and, on a small scale, cotton. From the citrus nursery many young trees are sent out to growers in the Colony.

In addition he is breeding pigs for the bacon factory, while he has a small flock of mutton sheep and upwards of 600 head of cattle, on which he is using Sussex bulls. The greatest care is taken to augment the supplies of farmyard manure, and the liquid from the yards is run into deep pits which are kept filled with litter and other waste vegetable matter. As an additional source of humus for the soil, green manuring of the fields and citrus groves is regularly practised. All arable land as it is opened up now is protected at once from erosion by storm water drains and contour ridges. A commencement has been made in applying fertilisers to pasture land, and on a kopje adjoining the farm house, which has been cleared and stumped, fenced in and heavily grazed, and to which various fertilisers have been applied, a very marked improvement in the grazing is to be observed.

This excellent idea of Captain Moubray's to invite his fellow farmers to visit his farm and study his methods and form their own opinions of the success or otherwise with which they are carried out is one which might well be followed by other farmers who have anything similar to show.

# Seed for Sale, Gwebi Farm.

Kinvarra Oats ... ... ... ... per 100 lbs. 25s.

Price is f.o.r. Gwebi. Cheques should be made payable to "Gwebi Farm." Orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury.

# Mycological Notes.

## THE FEW BROWN KERNELS IN YOUR MAIZE SEED.

[*Arrangements are almost completed for the importation of a supply of seed disinfectant for maize, but it must not be imagined that seed treatment will do away with the necessity for selection. Read what follows and you will understand why.*]

In the June issue of this Journal a general description was given of Diplodia in maize, when it was explained that the most serious phase of the disease was the reduction in stand caused by planting infected seed. It was pointed out that seed selection held an important position amongst control measures to be adopted, and it was particularly emphasised that all selected cobs should be free from discoloration of any kind; the most perfect show points should be entirely offset by the presence of a few brown kernels and the cob discarded. Some additional remarks were made about these few brown kernels, and it would be interesting to know how many readers gave them their serious consideration. For the benefit of the sceptical, we are this month publishing a few figures obtained from experiments carried out in the field and the mycological laboratory.

Since reaping commenced this season a considerable number of counts have been made of Diplodia-infected cobs found in the mealie cribs of farms in different districts. There was found to be wide variation between individual farms, but the average infection of counts of 200 cobs per farm, taken at random from heaps of reaped mealies, is just under 50 per cent., 48.7 per cent. being the actual figure. A number of cobs in various stages of disease were brought into the laboratory and counts made of kernels from cobs which would probably have been selected for seed. Some

interesting facts were brought to light with regard to the *few brown kernels* already referred to. Here is the analysis of a really excellent cob of Potchefstroom Pearl grown on light contact soil and which few farmers could resist when selecting seed:—

| | |
|---|---|
| Length ... ... ... ... ... ... ... ... ... | $9\frac{1}{2}$ inches. |
| Diameter— | |
| Two inches from tip ... ... | $6\frac{3}{4}$ inches. |
| Two inches from butt ... ... | $7\frac{1}{2}$ inches. |
| Weight (dry) ... ... ... ... ... ... ... | 1 lb. $3\frac{1}{2}$ ozs. |

Rows straight, no false grains, and kernels closely set and of good shape, BUT—

*Eight seeds at tip showed the typical brown and pinkish discoloration due to Diplodia.*

The cob was shelled row by row and each row laid out on a sheet of cardboard so that the complete cob could be viewed, as it were, from the inside. The picture, to the farmer who would have selected this cob for seed, would certainly be startling, for it was immediately obvious that visible infection had spread from the tip down as far as the twenty-seventh row, nine rows only—at the butt end—containing no discoloured grain. A count of the seeds showed that out of a total of 311 there were 174 visibly infected by Diplodia—that is, 55.9 per cent. From the remainder, which were apparently clean, 50 seeds were placed in a germinator and 34 developed a mouldy growth of Diplodia, indicating that, although showing no discoloration, they were carrying the fungus infection. Several similar cobs were treated in the same way and much the same results were obtained, whether the infection was at the tip or the butt, which illustrates quite clearly the insidious nature of Diplodia and the importance which should be attached to the *few brown kernels*.

Cobs which were more heavily infected, showing a brown discoloration for a distance of one to one and a half inches from tip or butt, were also examined. The discoloured seed was removed as in the usual process of tipping and butting, and representative samples of the remainder were placed in germinators. The average of four cobs tested showed a visible infection of 51.6 per cent. and a total infection of

71.6 per cent. Thus 20 per cent. of the seeds were apparently clean but carried Diplodia infection and these would respond to seed treatment, but of the 51.6 per cent. discoloured grain, a large proportion was too far rotted to obtain any benefit.

WHAT ABOUT SEED SELECTION NOW?

J. C. H.

# Government Demonstration Farms and Stations.

## GWEBI—MATOPO—TOBACCO EXPERIMENT STATION.

(*The report of the Chief Agriculturist for the year* 1928 *contains the following references to the work accomplished and in progress at the farms mentioned above.*—Ed., R.A.J.)

A perusal of the brief particulars which are later given of the crop yields obtained on these farms and stations, during a very unfavourable season, throws into strong relief the true agricultural possibilities of this Colony. The Gwebi farm, over 412 acres, produced 11.6 bags an acre of maize on a rainfall of 24.79 inches, in spite of an unbroken drought of 32 days from the 13th February to the 15th March. This return was 0.6 bag an acre higher than for the previous year, when 26.38 inches of rain were recorded and when intervening dry spells were not nearly of such long duration. On the Matopo farm Mr. Mainwaring produced 524 bags of maize from 108 acres on a rainfall of 12.59 inches, entirely unaided by irrigation—an average of 4.85 bags an acre. On the granite sand-veld area of the Gwelo Demonstration Station, five acres under maize experiments returned an average yield of 5⅛ bags of grain an acre under a rainfall of 19.61 inches, of which only 2.20 inches fell subsequent to

the 20th of January. On the red soil area of the same station maize yielded 6¾ bags to the acre, and ground nuts 12½ bags an acre. At the Bulawayo Demonstration Station, on an indifferent soil and with a 14.62 inch rainfall, of which only 1.5 inches fell after the 19th January, returns of grain were admittedly negligible, but large supplies of silage crops, coarse fodders and leguminous hays were produced.

On the Tobacco Experiment Station, Salisbury, from poor light sand, maize yields varying from 4.5 to 9.5 bags an acre were obtained after two fertilised crops of tobacco, without any additional fertiliser treatment to the maize. Under similar conditions maize and velvet beans grown together for silage yielded 8 tons of green fodder an acre, while ground nuts returned from 13.5 to 16.7 bags of unshelled nuts an acre.

No extraordinary or uneconomical methods were employed to secure these results, and if such can be obtained on the Government farms and stations, they can equally well be achieved and surpassed by the ordinary farmer when he has learnt the lessons which these institutions can teach him.

**The Gwebi Farm.**—The policy of conducting this farm on strictly commercial lines as a demonstration farm for Mashonaland has been adhered to. Four or five families of married settlers securing local experience before taking up land for themselves are usually in residence, but no claim is made to give these embryo farmers any special instruction other than that which they obtain by daily intercourse with the farm staff and by taking part in the ordinary operations of the farm. The staff consists of a manager, a stockman, an assistant for crops, and, lately appointed, a stores and accounts keeper.

The rainfall for the season totalled 24.79 inches, but an uninterrupted drought prevailed for 32 days, from 13th February to 15th March.

Maize being the principal grain of the farm, 412 acres were planted to this out of a total of 680 acres under crop. Two hundred acres were hand-planted in check rows and 212 acres were sown with the maize planter. A mean yield of 11.6 bags (203 lbs.) was obtained, the hand planted maize giving about 2½ bags an acre more than the machine planted,

the average yields being 10.4 and 12.8 bags an acre respectively. Ground nuts yielded 15 bags (75 lbs.) an acre, Kherson oats 600 lbs. grain, Kinvarra oats 423 lbs. grain, sunflower 9 bags (100 lbs.), Dolichos bean hay 2 tons, and maize and bean silage 6 tons an acre.

Owing to the late date at which the rains broke, farm-grown food supplies towards the end of the year became very scarce, and were barely adequate for the needs of the stock.

Since the policy of conducting the Gwebi as a demonstration farm was inaugurated, it has been realised that this movement would be of little value unless accurate farm costings of all the operations were kept. The work of keeping detailed accounts and records was more than the farm manager could cope with, and during the year a stores and accounts keeper was appointed. All farm books and records are kept by this officer, who has studied farm costings in England, and all details are submitted weekly or monthly to the Accountant of the Department of Agriculture, by whom the figures and records are checked and compiled. The first result of this system of costing was recently given in the *Agricultural Journal*, when full particulars of costs and profits on the fattening of 62 bullocks and 2 cows were published. The average profit on these animals, charging farm-grown food at fair market prices, and including all services and purchases, was £3 15s. 5d. per head, while in addition over 100 tons of farm manure was made in the process of fattening. The Farm Manager reports that—

> "The Friesland herd, both pedigree and grade, has continued to do extremely well. All cows are milk recorded, and particulars are published in the *Agricultural Journal*. Very few of the cows yield less than 3 gallons a day, and the average yield per cow in milk is 4 gallons.
>
> "The pedigree herd at the beginning of the year numbered 33 head, and at the end of the year 50 head. The grade herd numbered 33 females on the 1st January, 1928, and 61 at the close of the year.
>
> "The pigs—Middle Whites and Large Blacks—have proved profitable, the cross-breds being sold to the bacon factory and pure-bred Middle White boars and sows to local farmers. The most successful batch of bacon pigs were got away to the factory at 4½ months old, weigh-

ing 180-200 lbs. live weight. Considerable improvement in this direction has been effected since the new piggeries were built. Pigs on hand usually number about 50 of all ages, including 7 or 8 brood sows.

"Sheep have again failed to give good results, and the flock is gradually being disposed of.

"Thirteen acres of eucalyptus were planted out in January, and a fair stand of trees was obtained. Fifteen acres of bush land were cleared and stumped for tree planting this season. Development work of various kinds, to a modest extent, was also carried out in other directions. Nursery beds for the raising of 25,000 gums were prepared and sown; a commencement was made in roofing the grinding floor, and work was begun on three miles of public motor road which is to be opened through the farm."

**The Matopo Farm.**—Mr. Mainwaring, Agriculturist, was seconded as Manager of the farm towards the close of 1927, and has been in charge there during the year. The season was most unfavourable for crop growth, the rainfall, as shown below, being considerably below normal:—

Rainfall in Inches.

| | |
|---|---|
| October ... ... ... ... ... ... ... ... | 1.62 |
| November ... ... ... ... ... ... ... | 2.49 |
| December ... ... ... ... ... ... ... | 2.99 |
| January ... ... ... ... ... ... ... ... | 4.58 |
| February ... ... ... ... ... ... ... | 1.71 |
| March ... ... ... ... ... ... ... ... | 0.19 |
| April ... ... ... ... ... ... ... ... ... | 0.01 |
| Total ... ... ... ... ... ... ... | 12.59 |

The staff of the farm consists of two white assistants in addition to the manager, native labourers varying in number from 70 to 80 a month. Owing to two successive dry seasons the water in the dam fell to a very low level, and on this account only a small acreage of winter cereals was grown. Much good land below the canal has been rendered useless by abandoned and washed-out irrigation furrows. New furrows have had to be dug, and the old ones are being filled in as circumstances permit. Much of the labour has been employed on development work of a permanent character. The supply of voluntary native labour

has been fairly constant. Strict economy has been observed in the labour bill, which has been considerably reduced as compared with the previous year. The manager reports that the following permanent improvements have been effected with native farm labour during the year:—

(1) Piggeries, including feed room.
(2) Dairy.
(3) Bull boxes and calf houses.
(4) Implement shed.
(5) Piggery paddocks.
(6) Native compound (40 huts).
(7) Additions and improvements to dipping tank.
(8) 90,000 bricks of good quality were made.
(9) A well was sunk in sheep paddocks and water obtained at 30 feet.
(10) A new ground silo excavated.

His report continues:—

"With the exception of a small section adjoining the Matopo Estate, the boundary fence of the farm has been completed, all arable land has been fenced, and a large portion of the grazing land has been divided into paddocks. The main road through the farm to the Terminus has been made (a distance of three miles) at a comparatively small cost, and is greatly appreciated by visitors who wish to make a circular tour to the 'World's View.' Including other farm roads, between four and five miles of road-making has been completed. The farm was entirely devoid of exotic trees of any description, and in order to provide wind-breaks and to beautify the surroundings a beginning has been made in raising seedlings and planting trees. About 10,000 different kinds were planted, including several *Eucalyptus* varieties, *Pinus insignis*, *Pinus longifolia*, *Pinus halepensis*, *Cupressus arizonica*, *Cupressus lusitanica* and *Callitris calcarata*. Considering the very dry season, these trees have done extremely well; about 70 per cent. are established and have made very rapid growth. Of the *Eucalyptus* varieties, *E. rostrata* (red gum) has made the strongest growth. The performance of these improvements and the erection of buildings, of fencing and the cultivation and clearing of land which had been left idle for a number of years, in an efficient manner,

have demanded much attention, but they have been works of necessity, and will still further require to be carried towards completion before experimental work on an extensive scale can reliably and conveniently be carried out. As far as circumstances would permit, a number of experiments were conducted in growing various crops, and in most cases different varieties of each, in order to get some knowledge regarding their suitability to local conditions. Definite and reliable information regarding sound practices of field husbandry in Matabeleland is practically unobtainable.

"*Crops.*—108 acres were planted to maize for grain and 524 bags reaped, the yield being 4.85 bags (203 lbs.) per acre. Varieties grown were Hickory King, Krug (an early yellow dent hybrid), Potchefstroom Pearl and Salisbury White. One hundred bags of seed maize were sold to farmers and distributed through the Matabeleland Farmers' Co-op. Society. Fifty acres of maize were cut for silage. Sixteen acres of dolichos beans gave a very fine crop, and were harvested for hay and grain. Eight acres of ground nuts were planted, but, owing to drought and lateness of planting, proved a failure. Pumpkins yielded 12 tons. Of cattle melons, 60 tons were harvested, and 70 tons of veld hay were mown and stacked in good condition. About 24 acres were broadcasted to winter cereals under irrigation—oats and barley—which returned fair yields. Fifty-five varieties and selections of wheat, oats, barley and rye grown experimentally and under irrigation proved interesting and instructive, and the following varieties gave the most promising yields: Wheats—Kenya Governor, Droop No. 3, Union 17, Wit Klein Koren and Booren. Oats—Kinvarra C. 45 (a selection from the Salisbury Experiment Station). Barleys—Cape six-rowed was outstanding.

"*Live Stock.*—Trek oxen maintained themselves in fair working condition on the natural pasture during the dry season without extra feeding. They were constantly in hard work, and this satisfactory result must be attributed to allowing them to graze in paddocks instead of being kraaled at night. Forty bullocks were fattened during the winter, twenty-one of which were sent overseas and the remainder railed to Johannesburg

market, where they realised profitable prices. Eighty-seven store bullocks, principally Lincoln Red grades, were purchased for fattening next winter, but unfortunately three of these died during the month of October. The remainder of the stock on the farm, with the exception of pigs, which consist of Large Blacks and Large Whites—eminently suitable for bacon production—are as yet of a nondescript character.

"Specimens of various plants and seeds were sent for exhibition to the Bulawayo and Salisbury Agricultural Shows. Much practical interest was shown in these exhibitions, and much valuable information, tending to raise the standard of farming, was thereby disseminated. Our thanks are due to these societies for their assistance and co-operation in connection with these exhibitions.

"The work in the office is increasing; many enquiries are received from farmers as to the kind of crops they should plant, the time of planting and so forth. The information asked for has been gladly afforded. A keen interest has been evinced in the farm, by farmers in particular, and by the public in general. Visitors have numbered about 400, many of these coming from Northern Rhodesia and different parts of South Africa."

**Tobacco Experiment Station.**—The season on this station was none too favourable, the total rainfall amounting to only 22.22 inches, of which only 5.84 fell between the beginning of February and the end of April. All crops suffered from drought, especially maize. One hundred and fifty-four experimental plots were planted, the majority being half an acre in area. The principal field investigations in progress were:—

(1) Commercial fertiliser trials with tobacco.
(2) Distance planting trials with tobacco.
(3) Variety trials with tobacco.
(4) Various green manure crops in relation to subsequent crops of tobacco.
(5) Fire curing and air curing types of tobacco.
(6) Rotation experiments in which tobacco is the main crop.
(7) Yields obtainable from various crops following two consecutive crops of tobacco treated with fertiliser.

In addition, the following special investigations were carried out by the officers indicated:—

Irrigation Engineer.—Heat radiation tests in flue barns.

Mycologist.—Dusting experiments as a prevention against white mould in tobacco.

Chief Chemist.—Analysis of various cured and uncured types of tobacco leaf.

In all, 78 acres were under crop, of which 40 acres were planted to tobacco.

The tobacco crop suffered a severe attack of angular spot early in the season, but this was checked by vigorous priming, and very little spotted leaf was visible at curing time. The final yield of cured leaf, including scrap, was 24,088 lbs., or an average of 602.2 lbs. per acre. The percentage of scrap is invariably high owing to the greater handling the crop is subjected to when weighing to ascertain plot yields. The average return per acre was reduced by reason of some of the later planted plots failing to ripen and being left unreaped.

In the course of his report on the year's work the Manager of the station states:—

"In addition to special exhibits prepared for the Agricultural Show, 290 lbs. weight of samples comprising various grades, varieties and types of tobacco leaf were packed for despatch to the High Commissioner's office and the Continent. A comprehensive exhibit of tobaccos and various crops grown on the station was staged at the Salisbury Show.

"A new field, twelve acres in extent, was stumped and cleared. Eight acres of vlei land was prepared and put under winter crop experiments. Two new furnaces, namely, the 'Carolina' and the 'Rhodesian,' were built into Nos. 5 and 6 barns respectively.

"Forty additional fruit trees were planted in the orchard, bringing the total number of trees to one hundred. The orchard is an experimental one, new varieties of plums, peaches, apples, apricots, etc., being tried out under the direction and supervision of the Government Horticulturist. Demonstrations and practical instruction in orchard work are given to the apprentices by means of this orchard."

# Salisbury Agricultural Experiment Station.

## ANNUAL REPORT, 1927-28.

*(Concluded.)*

By H. C. ARNOLD, Station Manager.

**Kudzu Vine** (*Pueraria Thunbergiana*).—Leguminous plants which are perennial and suitable for use as pasture or hay are especially valuable to stock farmers, because when once established they are capable of providing fodder which is rich in protein for a number of years. Much attention has been paid here to plants which possess these characteristics with a view to discovering those which are adaptable to our climatic and other conditions. Among such, the kudzu vine has given the most promising results so far. A plot of kudzu planted here nine years ago has continued to thrive, its vigour apparently increasing with its age. This distinguishing feature makes it superior to most of the other perennial fodder plants which have been introduced and tested here, for in nearly all cases they have weakened and finally died after a few years. The chief drawback with the kudzu is that it does not produce much fodder for the first two or three years. Having become established, however, it will yield two or three cuttings of stock food of high quality each season for many years. Analyses of fodder grown at this station indicate that its feeding value equals that of lucerne and other well known legumes. Although live stock need to acquire a taste for it before eating it freely in its green state, they eat it with relish when it is converted into hay or silage. Being a permanent crop which propagates itself by means of trailing vines which "strike" root at frequent

intervals, it is thought that it may prove useful in checking soil erosion, and also that it may be found less troublesome to establish on hillside land, where the soil brought down through erosion will fix the vines and induce them to form new crowns more freely than is the case on flat land, excepting when they are layered for that purpose. The fodder may be grazed off by cattle, but this method of treating it is a wasteful one, because much of the vine is trodden and soiled, and is left uneaten. A better plan is to cut it and feed it in the green state or to convert it into hay or silage. It has been observed also that when cattle are allowed to graze on kudzu during the summer and autumn, they introduce the seed of grass and other weeds, which reduces the value of the herbage. It is thought, therefore, to be inadvisable to allow live stock to graze on land under kudzu, particularly during the summer and autumn months.

Green kudzu fodder cures into hay more readily than other legumes such as cowpeas, dolichos beans and velvet beans, and in favourable weather the hay will be ready for stacking in from three to seven days after the crop is cut. The leaves of the kudzu do not shed so readily during the curing process as do those of many other crops. Another characteristic of this plant, which adds to its value considerably, is its ability to produce a large quantity of fresh green fodder very early in the season without the aid of artificial supplies of water. Because of this, the kudzu forms a useful connecting link between the crops which provide succulent winter feed and the summer herbage, and should prove especially valuable to the dry land farmer who needs a continuous supply of succulent fodder for his dairy cows, pigs or poultry. Cuttings made here during October have yielded from two to four tons per acre of green material. During the early summer rapid growth is made and heavy crops of fodder are produced even in seasons with a low rainfall. In February the rate of growth decreases, and during that month or early in March the crop should be converted into hay or silage. Little growth is made between March and August, but with the advent of warm spring weather new vines appear and grow with surprising rapidity. The yields of green fodder reaped each season since 1920 from a plot of kudzu which was laid down here in 1918 are given below:—

| Season. | Tons per acre. |
|---|---|
| 1920 | 3 |
| 1921 | 6 |
| 1922 | 7 |
| 1923 | 8.6 |
| 1924 | 7.4 |
| 1925 | 8.7 |
| 1926 | 10.5 |
| 1927 | 11.9 |
| 1928 | 9.0 |
| Total yield over nine years | 72.1 |

Phosphatic fertiliser in the form of bone and superphosphate was applied at the rate of 200 lbs. per acre to part of the plot in 1925, but at no other time has fertiliser been used on this land. It will be seen therefore that the heavy yields obtained fully justify the expenditure of the small amount of cash, perseverance and patience necessary to get the crop well established with a thick stand of crowns evenly distributed over the land. The quickest and most reliable method of establishing the kudzu is by transplanting crowns which have one or more large tuberous roots. The best crowns are those obtained from a field which has been established a number of years, and they should be planted in holes previously deeply dug and well prepared. When a large number of crowns are to be planted, it is more economical to open trenches with a suitable implement than to dig separate holes for each. The crowns are then planted at 6 feet to 10 feet apart for those of ordinary size, but large crowns can be spaced as far as 20 feet apart. The term "crown" is applied to a stem with its tuberous roots attached. The accompanying illustrations show various methods of propagation. Plate No. 20 shows the tuberous portion of a kudzu root system taken from a plot which was laid down here eight years previously. The vine A B grew from the large crown, and has produced two smaller crowns. The portion marked C is the stem of the plant, and from this part new vines arise. The tuberous roots are unable to make new growth when they are detached from the stems. For this reason, during the operation of lifting the crowns for transplanting, care must be taken not to injure the "neck" which joins the swollen part

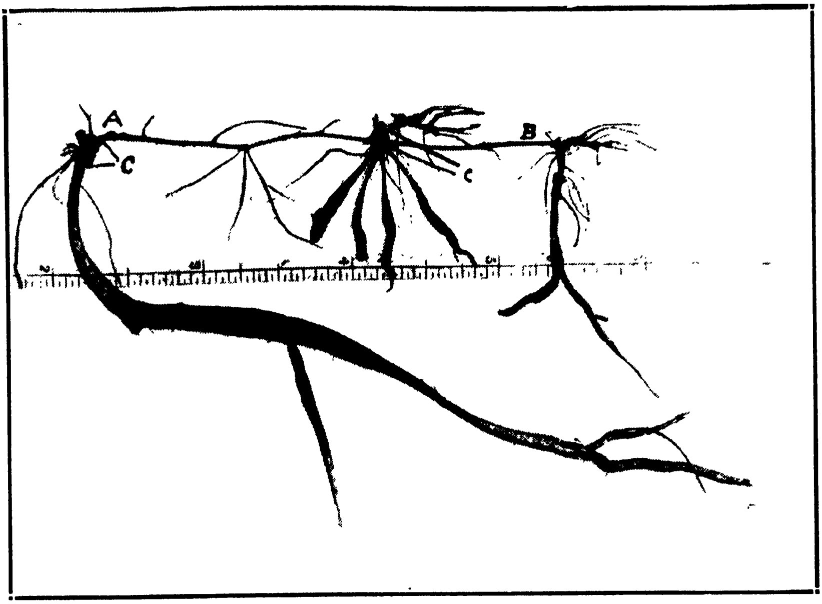



Plate No. 20.—Tuberous root system of kudzu vine, showing large primary crown 5 feet long and secondary crowns attached to vine A B, which was layered to induce propagation.

Plate No. 21.—Kudzu vines can be rooted in tins placed near the parent plant. Several new plants can be obtained from each vine by this method.

Plate No. 22.—Kudzu vine 40 feet long, one season's growth. The portion on the left was "layered" at the beginning of the season, and has made strong roots at nearly every leaf node. Vigorous vines like this are the best for propagation purposes.

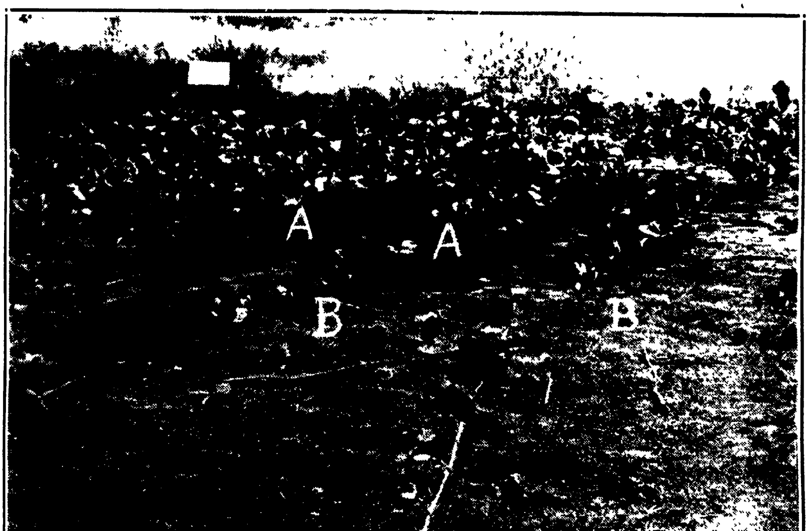



Plate No. 23.—Kudzu, showing manner of layering runners. "A" indicates furrows opened to receive the runners; "B" shows the furrows filled in over the vines, but with leaves left above ground.

of the root to the stem. The tuberous roots form a tangled mass in the upper two feet of soil, but smaller roots penetrate for several feet deeper, and because of this the plants are able to utilise underground supplies of moisture for making early spring growth. The operation of lifting the crowns for transplanting may be facilitated by first digging a trench two to three feet deep at the edge of the field; then, by removing the soil from between the roots with a pointed tool, they can be extricated undamaged with little difficulty. When the crowns are replanted the roots should be spread in a natural manner below ground, leaving about an inch of the stem protruding above the surface. If the crowns are carefully lifted and replanted very few fail to grow if the operation is followed by favourable weather. They should be protected from the drying effect of sun and air from the time they are lifted until they are replanted, as they lose their vitality if they become dry, but they may be kept in good condition for several days if they are moistened and placed in a sheltered situation.

If sufficient crowns cannot be obtained, propagation may be effected by means of rooted vines. These should first be rooted in tins in readiness for planting in permanent quarters when favourable weather arrives. (See Plate No. 21.) Tins partly filled with soil are placed near the parent plant so that the vines may be layered in them. Vigorous young vines are the best for this purpose, and they should be wound round on the surface of the soil, so that two or more leaf nodes are inside the tins. To prevent them from becoming loosened by the wind, they must be firmly covered with two inches of soil. By placing the tins in ranks a number of new plants can be obtained from each vine. Under favourable conditions rootlets appear at the leaf nodes within a few days, but the young plants should remain attached to the parent plant for a further three to four weeks, so that they may develop strong root systems. When this is accomplished the parent vine may be severed and the new plants will be ready for transplanting into permanent quarters. Although a number of plantlets may become established in each tin, it is better to plant the whole ball together in one place than to separate them, because the kudzu will not tolerate much disturbance of its roots. If propagation is commenced early, upwards of

one hundred young plants can be obtained from one kudzu plant in a single season. Unless artificial means for supplying water are available it is not advisable to transplant the rooted cuttings to the open ground after the middle of February. Any that are "struck" after that should be left in their tins, attached to the parent plant, or preferably, removed to a site where they can receive moderate supplies of water until the next wet season.

A third method of propagation is by means of the seed. In their seedling stages the plants grow rather slowly, so the seed should be sown in tins as early as July or August in order to secure strong plants for planting out during the following December or January. To ensure success the roots of young kudzu plants must be disturbed as little as possible during transplanting operations, and for this reason it is much better to sow the seed in tins than in nursery beds, unless it is intended to leave the plants in the beds for two or three years to form tuberous roots before transplanting them. Trial sowings in the open ground have not proved successful here, for it is found that the young plants do not develop sufficiently during the wet season to be able to withstand the rigours of the winter drought. It is concluded, therefore, that only in cases where water can be supplied by artificial means should sowing *in situ* be attempted. The vitality of kudzu seed is often low; a germination of 20 per cent. only is usually obtained. Seed is seldom produced in this Colony, and that used has to be imported from Japan, but it is now stocked by local seedsmen, who are able to supply farmers' requirements.

A fourth method of propagation is by "cuttings" formed of detached vines, but those which are thinner than a lead pencil are not very suitable for this purpose. (See Plates Nos. 22 and 27.) The best results are obtained when the woody part of the vine, which is situated near the parent plant, is included, and they should not be cut into sections, for better results are obtained when the vines are used whole. The selected vines should be carefully disentangled from the mass, and severed near the parent crown; about three-quarters of the leaves should be removed, and for convenience of handling the vines may be wound into spools after the manner of fencing wire, care being taken not to break them. With

as little delay as possible these must be laid in furrows and covered with three or four inches of soil trodden in to ensure the close contact of vine and soil, but leaving a few leaves above the surface. This work should be performed during showery weather, and not later than the middle of February, unless an artificial supply of water is available. A dressing of fertiliser composed of equal parts of superphosphate and sulphate of ammonia applied in the furrows at the rate of 1 lb. to 30 feet has been found to stimulate the formation and growth of the new plants in a remarkable manner. Kraal manure is also excellent for this purpose, but should not be used on new plantations if there is danger of attack from white ants.

Another method which has been employed here with success is that of planting the vines in holes excavated to a depth of two to three feet by three feet wide and left open for some time to become well soaked by rain. The butt ends of two or three vines are anchored at the bottom of the hole, and the remainder are twisted round in the form of a spiral, earth being added meanwhile and trodden into contact with the vines, so that when the work is completed about half of each vine lies coiled within six inches of the surface, while the tips and a few leaves protrude above ground. This method is more troublesome than the other, but if a period of dry weather follows the planting operations, the vines in the holes suffer less than those in shallow furrows, because the part which is planted deeply rests in moisture, which it absorbs for the benefit of the remainder. If the work is undertaken on a large scale, it will be more economical to open trenches two to three feet deep, planting the vines at intervals of three to six feet apart and placing them obliquely in the trenches, so that while the butt ends are near the bottom, the other ends will rest a few inches below the surface, neighbouring vines being parallel, but separated from one another.

Having succeeded in establishing a number of kudzu plants by either of these methods, the farmer should endeavour to obtain a thick stand of crowns, distributed evenly over the land, not more than a foot apart in any direction. This is desirable in order that weeds may be excluded as much as possible, and also that the subsequent growth may

be fine and suitable for stock feed; for, although thick, rope-like vines are the best for propagation purposes, they are not suitable for fodder. As soon as they are well established, the plants send out vines in all directions, and under favourable conditions these will "strike" and form new plants as they grow. During unfavourable weather and in situations exposed to high winds, the new plants occur at less frequent intervals than is required, but this can be overcome by pegging the vines down or by layering them in the manner illustrated in Plate No. 23. With a pointed hoe or stick, small furrows two or three inches deep are made at the required intervals, and the vines are laid in them and covered with soil, only the leaves and about two feet of the growing tip being left above the surface. Kraal manure and/or phosphatic fertilisers placed in the furrows greatly accelerate the formation of new plants. Within a few days rootlets appear at all the leaf nodes, and eventually new vines are formed, which may also be layered, and the work should be continued in this way until a stand of the required density is obtained. On hillsides, if the vines are trained in the opposite direction to the slope of the land, the natural erosion of soil is sometimes sufficient to fix them and induce them to "strike" at frequent intervals.

Proceeding in this way a strip of land fifteen to twenty-five feet wide on either side of the original rows can easily be laid down to kudzu each season. Thus, even if the rows of parent crowns were first established as far apart as one hundred feet, the space between them could be covered with kudzu in from three to five seasons. Meanwhile other crops could be planted on the vacant land with a view to layering the growing vines under them as the season advances. (See Plates Nos. 24 and 25.) This would probably be the least expensive way of putting land down to kudzu, but if preferred, the plants may be established at ten to fifteen feet apart, so that the whole area may be covered within a season or two.

The kudzu does not thrive on water-logged soil, and it should not be planted on land which is likely to remain sodden more than a few days after heavy rains have fallen. Numerous nodules appear on the roots of the kudzu, indicating the ability of the plant to acquire nitrogen from the air; but if

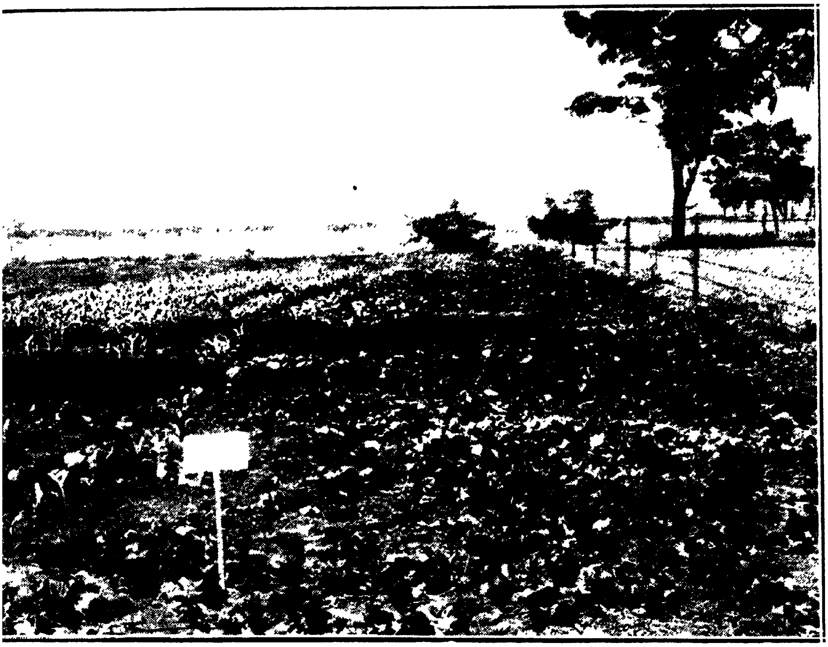


Plate No. 24.—Kudzu establishment trials. Roots planted February, 1926: photograph taken 14th January, 1927. Maize planted close to kudzu (looking westward). Agricultural Experiment Station, Salisbury.

Plate No. 25.—Kudzu establishment trials. Photograph taken May, 1927. By comparing this illustration with Plate No. 24 the progress of the kudzu may be noted. The kudzu has now become established under

Plate No. 26.—Photograph taken 17th November, 1926, illustrating the luxuriance of the growth made by kudzu before the advent of the rainy season.

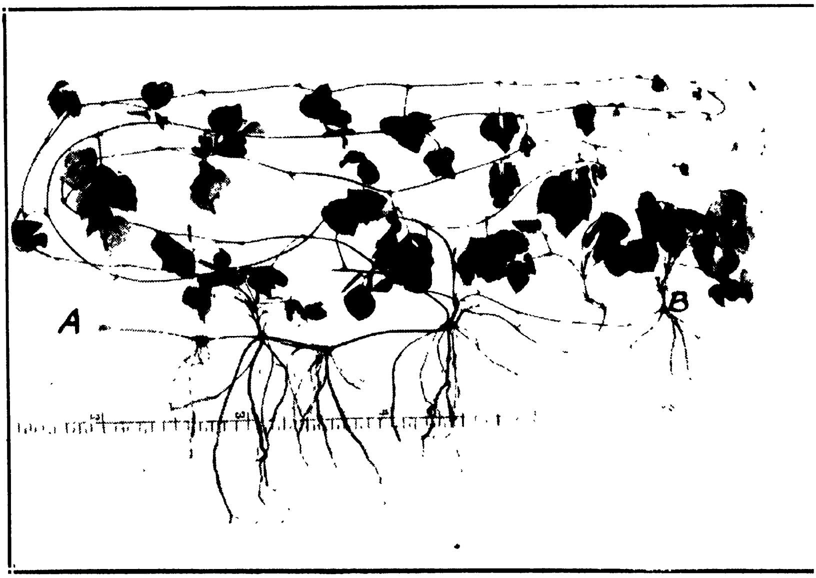



Plate No. 27.—The vine A B was layered in February, 1926, and lifted a year later. The illustration shows the root development and top growth made during that period. Note that the parent vine links the whole root system of the new crowns together to their mutual benefit.

the soil is lacking in phosphates, these should be applied. It has been found here that when phosphates are added to the soil at transplanting time, the young plants become established much quicker, and are better able to resist the effects of drought than when they are planted without fertiliser.

During the ten years that this plant has been cultivated here it has not suffered serious damage from insect pests or diseases. Sometimes newly planted crowns or vines are attacked by termites, but when they have become established the plants appear to be able to resist such attacks and even to thrive on active termite nests.

It will be seen, therefore, that the kudzu lends itself to propagation in several different ways, and that a good deal of the work of establishing it can be undertaken during periods of wet weather when maybe other operations on the farm cannot be proceeded with. Because of this, the initial expense of establishing it on a small scale need not be very great. Farmers are urged to give it a fair trial and to suspend judgment until it has had time to become well established, for, although a few seasons must elapse before much return is obtained, the trouble is eventually well rewarded by heavy crops of valuable fodder over several seasons for little further expense.

**Grasses.**—Considerable experimental work, with the object of procuring species of grass suitable for improving our pastures, has been conducted here during the last decade, and it is regretted that at the present time it is not possible to issue a full report of this work.

Briefly, the results of these experiments indicate that, with the possible exception of a few kinds suitable only for vlei and irrigated lands, the exotic grasses do not thrive as well as some of the indigenous grasses.

One drawback to the propagation of several promising perennial native grasses, and in particular those which possess the ability to spread by means of stolons or runners, is that they do not produce much virile seed, though in some cases seed heads are produced in profusion. This necessitates their propagation by means of root cuttings, and although this method is more troublesome than that of sowing the

seed, it yields a quicker return, and if the cuttings can be grown on the farm and the work of planting them is well organised and performed, it may be found to be less expensive and more reliable than that of sowing purchased seed. Among the kinds suitable for propagation in this way are Hunyani grass (*Eustachys gayana* var.), Woolly Finger grass (*Digitaria eriantha*, var. *stolonifera*), Swamp Couch grass (*Hæmarthria fasciculata*), Melanje grass (*Digitaria melanjiana*), etc.

Some of the "tufted" species produce a quantity of seed, and it is thought that among them may be found varieties which will lend themselves to establishment by this means. Among such are Rhodesian Blue grass (*Andropogon gayanus*), Reed Timothy (*Setaria phragmatoides*), Purple-topped Buffel (*Panicum maximum*), etc.

Trials made here on a small scale indicate the possibility of establishing pastures equal to those of other countries where the climatic conditions are similar to those of this Colony. The isolation and establishment of the most suitable kinds of grasses is not the only factor of the pasture problem, however; equally important are the questions of manuring and management. It is well known that the nutritive value of grass decreases with its age, and that frequent cutting or grazing reduces the total yield in nearly all cases. This raises the question as to how much of the "quantity" should be sacrificed in order that fodder of high quality may be obtained.

The analysis of a sample of Reed Timothy cut here on 15th January from pasture which had been grazed down a month previously, showed that it contained over 16 per cent. of protein (which amount equals that contained in lucerne), but a sample of the whole season's growth cut from the same plot in April contained only 7 per cent. of protein. Analyses of samples of other grasses taken at the same time show similar decreases, and in some cases the protein content was as low as 3 per cent. in the April fodder. The minerals showed an even greater decrease as the age of the grass advanced. In some species the content of certain mineral elements known to exercise an important influence in the digestive process was found to be ten times greater in the young grass than that contained in the older grass of the

same species. When it is remembered that the older grass contains much more indigestible fibre than the younger, it will be seen that the chemical composition indicates that each ton of young grass has a feeding value equal to about three tons of the mature grass, but it is highly probable that its biological value is much greater than this because of the increase in its mineral composition and also its palatability, which together increase the amount of fodder consumed and the proportion of food constituents extracted from the fodder, making the young grass of far greater value as a source of nutrients for the stock.

On the experiment plots here, which contain over sixty different kinds of grass, a part of each plot has been cut in January of each year, and it has been observed that, irrespective of the species, the cattle, when turned on to the plots in August, always preferred the aftermaths growing on the cut patches to the whole season's growth. Not until all the aftermath growth is finished on all the plots do the cattle commence to eat the more mature grass, in spite of the reputation which some of them have for "sweetness." These facts show the importance of making use of grass while it is young, either by allowing stock to graze it or by cutting and preserving it for future use. With a view to investigating this aspect of the problem, further new plots, containing all the more promising grasses, are being laid down. These will be grazed at frequent intervals in order that the suitability of the various grasses for such treatment may be ascertained. Even the sour and also the coarse "Tambookie" types of grass provide good grazing while they are in the young stages of growth, but the mature grass is useless as fodder. Palatable and nutritious fodder can be obtained for a longer period on this type of veld if the grass is cut or grazed closely two or three times during the summer season, but if this practice is persisted in over a number of years the coarser grasses will become extinguished and their places will be taken by other grasses which are better able to withstand such treatment. On the other hand, constant close grazing through over-stocking should be avoided, because it extinguishes the intermediate types of grasses which are nutritious and have a long growing period, and encourages the multiplication of weeds which are unpalatable to stock, and dwarf perennial

and annual grasses which have a short growing period. Thus, persistent over-stocking reduces the stock-carrying capacity of the veld.

It is thought, therefore, that, while it may be necessary to establish one or other of the different kinds of grass which may prove itself adaptable to artificial conditions in order to obtain the highest class of pasturage, fodder of higher quality than that usually secured could be obtained from the natural veld if it was more judiciously managed. Our experiments indicate that on veld similar to this, which is composed largely of Rooi or Oat grass, farmers would find it profitable to cut their grass during January and to convert it into hay or silage. If this were practised, both the preserved fodder and the aftermath would have much higher nutritive value than fodder made from mature grass. It is suggested that areas not suitable for mowing could be grazed down until the middle of January and then left to grow an aftermath for winter pasture. Meanwhile the cattle would find autumn pasturage on those parts of the farm which carry the "sweeter" types of grass, which are usually dwarf and produce quantities of seed. Such areas could be reserved for autumn and winter feed if it is not practicable to convert the grass into hay.

When cattle are allowed to roam at will over the whole of the available pasture land, they eat the finer and more nutritious grasses, and by leaving the less valuable kinds untouched encourage their propagation, to the detriment of the finer grasses, which gradually become eliminated. By paddocking and rotational grazing the cattle may be compelled to eat the less palatable grasses as well as the others, and the period during which good grazing is available may be considerably lengthened and the stock-carrying capacity of the veld proportionately increased.

Acknowledgments are made of the co-operation of the Chief Chemist and his staff, who have supplied the analyses of the fodders and ground nuts contained in this report, and to Mr. S. D. Timson for several of the photographs.

(Published with the approval of the Chief Agriculturist.)

# Talks to Poultry Keepers.

## THE BREEDING STOCK.

Issued by the Poultry Branch, Department of Agriculture.

All poultry breeders desire good hatchable eggs with strong germs and chicks easy to rear. The point is, how to produce these. It is a matter of common sense and care. To lay well a bird must eat well, and to lay good hatchable eggs she must have good quality food. Cheap feeding and inferior foods mean poor hatchable eggs and weak chicks. The breeding bird must have plenty of green succulent food, and foods containing a good percentage of mineral salts must be given. She must not be forced for eggs. The hen that gives ten strong chicks from every twelve eggs put down, eight of which reach maturity, is the one to breed from; not the one which gives only six chicks from every twelve eggs, two of which only can be reared to maturity. The former, provided she has a good egg record behind her, is the one to be the mother of the stock cockerels.

All birds that are going into the breeding pens should have free range if possible, and good comfortable houses. They should be kept just laying; we do not want *too* many eggs from the breeding hens. Free range will be productive of fewer eggs, but they will be better ones for hatching than those from birds kept under the intensive system. Birds intended for breeding should never be coddled when young; they must always be strong and healthy from the day they are hatched. Strong, vigorous birds that have been good layers should be kept as long as they produce good fertile eggs and robust chicks.

The breeding pen should be in a sheltered place, but not close and stuffy. Good hatching results will never be obtained if the breeding birds are exposed to wind and rain with no shelter. There is nothing like wind sweeping over the ground to cause infertility and bad hatching and rearing. Never mate a cock bird three years old to hens three years old and over; if the latter are three or four years, or even more, the male bird must be a young vigorous male. You can have age only on one side. This Branch believes in breeding from hens even if they are in their third and fourth year, provided they have been good layers in their first and second years, strong and healthy, and their eggs hatchable, and the germs strong. Breeding stock must on no account be forced. They must not have too much animal protein, and should be fed on more grain than mash. They should be kept free from excessive internal fat. Scratching exercise they *must* have.

It is better to mate early and allow six or eight weeks to elapse before the first eggs are set; you are then likely to get more pullets than cockerels. If the first eggs are set a few days after mating the cockerels are likely to predominate for the first two or three months. Highly strung, squalling hens should never go into the breeding pen; for best results, contented, quiet hens and those that are happy and agree should be used and kept in a quiet spot.

The birds, including the male, must be kept free from insects, otherwise poor laying, infertile eggs, weak germs and weak chicks will be the result. Birds that are over-fat or over-thin are more subject to lice than those that are not so, and remember that a louse can be a grandfather in twenty-four hours.

# Southern Rhodesia.

## PRELIMINARY ESTIMATE OF THE AREA PLANTED AND YIELD OF THE PRINCIPAL SUMMER CROPS, 1928-29.

Compiled by the Government Statistician.

The usual preliminary estimate of the acreage and yield of the principal summer crops for the season 1928-29 has now been completed.

The estimate is based on (a) information supplied by all farmers as to the acreage they had planted or proposed to plant to the crops in question, while the yield is based on a consideration of the out-turn district by district during the last ten years, supplemented by reports from upwards of 200 leading farmers as to the probable acre-yield in their respective localities.

**Maize.**—The acre-yield for the season, based on information supplied by the Bureau's honorary crop reporters, is estimated at 5.83 bags, compared with 4.29 bags in 1927-28 and 6.20 bags in 1926-27, and an average for the ten seasons from 1918-19 to 1927-28, inclusive, of 5.37 bags. The acreage returned by farmers as planted to maize for the season 1928-29 amounted to 337,600 acres, easily the largest acreage ever recorded. This acreage exceeded that of 1927-28 by 42,310 or 14 per cent.

On the basis of the foregoing figures, the total out-turn of maize for the season is estimated at 1,970,000 bags, being 701,900 bags or 55 per cent. greater than the out-turn in 1927-28, and 310,400 bags or nearly 19 per cent. better than in 1926-27, the previous best on record.

The estimates for the principal maize growing districts included in the above total for 1928-29 are as follows:—

**Mashonaland.**

| | Bags. |
|---|---|
| Mazoe ... ... ... ... ... ... ... ... ... ... | 776,000 |
| Salisbury ... ... ... ... ... ... ... ... ... | 310,000 |
| Lomagundi ... ... ... ... ... ... ... ... | 274,000 |
| Hartley ... ... ... ... ... ... ... ... ... ... | 207,000 |
| Victoria ... ... ... ... ... ... ... ... ... | 44,000 |
| Ndanga ... ... ... ... ... ... ... ... ... ... | 34,000 |
| Makoni ... ... ... ... ... ... ... ... ... ... | 17,000 |
| Marandellas ... ... ... ... ... ... ... ... | 14,000 |
| Other districts (11) ... ... ... ... ... ... | 84,000 |
| Total—Mashonaland ... ... ... ... | 1,760,000 |

**Matabeleland.**

| | Bags. |
|---|---|
| Gwelo ... ... ... ... ... ... ... ... ... ... | 83,000 |
| Bubi ... ... ... ... ... ... ... ... ... ... ... | 37,000 |
| Nyamandhlovu ... ... ... ... ... ... ... ... | 34,000 |
| Bulawayo ... ... ... ... ... ... ... ... ... | 19,000 |
| Matobo ... ... ... ... ... ... ... ... ... | 13,000 |
| Other districts (8) ... ... ... ... ... ... | 24,000 |
| Total—Matabeleland ... ... ... | 210,000 |
| Total—Southern Rhodesia ... ... | 1,970,000 |

**Tobacco.**—As was anticipated, the area returned by growers as planted to tobacco for the season 1928-29, viz., 18,300 acres, shows a very considerable reduction compared with the total of 46,622 acres planted in 1927-28, the reduction amounting to 28,322 acres or 60 per cent.

For various reasons the acre-yield for 1928-29 for the country as a whole is put at 415 lbs., compared with a realised acre-yield of 535 lbs. in 1927-28, 638 lbs. in 1926-27 and an average for the ten seasons ended 1927-28 of 476 lbs.

Combining the foregoing figures gives a total estimated production of tobacco in 1928-29 of about 7,600,000 lbs., of

which the yield of saleable tobacco may be put at about 6,000,000 lbs., or perhaps a little more.

**Ground Nuts.**—Farmers generally have shown a disposition to recognise the value of ground nuts and to increase the area planted to this crop. The total area reported for 1928-29, by far the largest on record, amounted to 11,600 acres, thus exceeding the area planted in 1927-28 by 4,718 acres, and in 1926-27 by 3,787 acres.

The acre-yield for 1928-29 is estimated at 7.7 bags, as compared with a yield of 7.4 bags in 1927-28, of 8.4 bags in 1926-27 and 1925-26, and an average of 7.0 bags for the last ten seasons.

These figures indicate a total yield for the Colony as a whole of 89,400 bags, this latter figure representing an increase of 38,180 bags or 75 per cent. over the corresponding result for 1927-28, and of 23,466 bags or 36 per cent. over that for 1926-27.

**Cotton.**—At 2,528 acres the area planted to cotton in 1928-29 was nearly double that of 1927-28, viz., 1,340 acres, but the present transitory stage of cotton growing in the Colony hardly warrants further comparisons with earlier years.

During the present season about one-third of the acreage reported was under the new jassid-resistant variety known as U. 4, evolved at the Gatooma experimental station, while a further small acreage was devoted to another variety known as A. 12. Both of these varieties are reported to be doing well, especially the U. 4, which is being grown under the supervision of the cotton specialist appointed by the Empire Cotton Growing Corporation.

Reports from independent growers in various districts have been decidedly optimistic, and it is considered necessary to discount their anticipations.

As a result, the out-turn for 1928-29 is estimated at 474,000 lbs. of seed cotton, giving an acre-yield of about 188 lbs., but this yield might easily be increased should the expectations of some reporters be realised.

# Fencing Material from Loan Funds.

The following motion was moved by Captain L. Green, D.S.O., M.C., Member for Marandellas, during the recent session of the Legislative Assembly:—

> "That the Government take into serious consideration the provision of loan funds for the purpose of purchasing fencing material in bulk to enable fencing to be carried out at a lower price."

The Minister of Agriculture and Lands replied as follows:—

"I very much sympathise with this motion. Really what is at the back of the motion is the provision of cheap fencing, providing fencing at as low a price as possible to the farmer. Of course, in the past we have had a good deal of experience in connection with fencing for Coast Fever. I remember during the war period compulsory fencing here for East Coast Fever, and the farmer had to pay for it; the cost of fencing was very high indeed, and ran in some cases into nearly £100 a mile—£70, at any rate. Well, I think the Government since those days have done their best to lower the cost of fencing in connection with East Coast Fever, and the position to-day is that they call for tenders for the supply of this fencing. The merchants who provide it have also in cases undertaken to erect it, and in that way fencing has been obtained at a comparatively low rate. But I would point out that the Government do now provide loan funds for that purpose, and a good deal of fencing is done in that way, but I am not quite convinced even now that we get the fencing at as low a cost as we should get it—(Hear, hear). However, so far as that is concerned I intend investigating the matter and seeing exactly how we stand. I may say that in connection with the last tenders called for fencing there was only one tender put in, and that was by a firm who were also manufacturers at Home. It appeared to me rather strange. One would have thought there would be more competition for this Government fencing than that, and in connection

with that I thought the hon. mover of this resolution would have given us some figures with regard to fencing. I would like to compare his figures with figures that the Government have themselves from the tenderer for fencing. I think it possible that we could get fencing direct from Home in bulk, or at all events for substantial orders, at a lower cost than we have had to pay up to now to local merchants. However, the hon. mover of the resolution did not touch on cost at all. I do not think there is any harm in quoting the following figures. The last tender we had for this year was from 1st April, 1929, to 31st March, 1930:—

'(2) The price f.o.r. at Umtali, Salisbury, Gwelo, Bulawayo and Fort Victoria for "all British" fencing (4 strands 12½ ft. barbed wire, 1½ in. straining pillars) is from £34 10s. to £36 per mile.

If 56 lb. rail strainers are supplied instead of 1½ in. pillars, the price ranges from £29 18s. 6d. to £31 7s. 6d.

Fifteen-foot tubular gates are quoted at approximately £5 each.'

Well, that does not appear to me very low — [MR. EICKHOFF: Is the wire quoted separately?]—It is in the tender, but it is not here. You can get fencing at a very low rate by taking foreign fencing, but the quality is nothing like British fencing. Another thing, we prefer the British article because we wish to put our business into the hands of British firms rather than give it to foreign firms. It is in that connection that I am sympathetic to this resolution. Between this and next session the Government will find out exactly what they can purchase fencing for direct from the manufacturer. I know there is an idea that we should not go outside Rhodesia, and nobody wishes to do so; but when you advertise and only receive one single tender, there is no reason why we should not find out what we can get quotations from Home manufacturers for—(Hear, hear). As I said, the Government have in the past spent large sums on fencing for the eradication of East Coast Fever, and that expenditure has come from loan funds, as the farmer has to pay it. There is a hypothecation on his farm, which he pays off in 17 years. I do not suggest that we can at once

seriously consider the provision of loan funds for the purchase of fencing in bulk—at least, not at this juncture. If that is considered it will have to be next session, in making up the new Budget. One also hopes that if we get this new policy working there will be less necessity for Government fencing, though in the case of outbreaks of East Coast Fever in future I think it will entail a bit more fencing. . . . The hon. mover of the motion spoke of the benefit of fencing; well, I am in sympathy with him there. There is hardly anything that can be done for the farmer that brings so much benefit, both to the farmer himself and to the country, as fencing. But one can hardly ask the Government off-hand to go in for a national scheme of fencing from loan funds. It might be considered a legitimate scheme, but it would be a big undertaking, and the Government would have to have considerable time to investigate it and make up their minds. As the hon. the mover has now ventilated the subject, I suggest he withdraw his resolution after he has replied, and the Government will go into the question of the cost of material and see what could be saved by importing fencing from the manufacturers in England direct."

The motion was by leave withdrawn.

# Acceleration of the Sprouting of Seed Potatoes.

The Manager of the Agricultural Experiment Station, Salisbury, has recently drawn attention to the greatly accelerated sprouting of seed potatoes which results from treating the seed with carbon bi-sulphide. The discovery was made more or less accidentally when fumigating the seed to destroy potato tuber moth. The slow rate of sprouting which often obtains during the cold months in Rhodesia frequently delays the date at which winter crops to be grown on moist lands or under irrigation can be planted, and the carbon bi-sulphide treatment seems likely to overcome this difficulty. On the Experiment Station two tablespoonfuls

of the fumigant have been used in a cubic yard of seed, the potatoes being exposed to the gas for twenty-four hours. Within ten days 70 to 80 per cent. of the seed should show signs of sprouting.

Care should be taken not to use too much carbon bi-sulphide, as an excess may possibly injure the tubers, though larger size seed than the normal may possibly benefit from a slightly stronger solution. The tubers should be placed in an airtight container for preference, and the carbon bi-sulphide in a saucer or some similar receptacle, on the top of the seed. It is probable that a pit in the ground covered with a tarpaulin, the sides of which are covered with sand or earth, would prove as effective as a metal or wooden receptacle. It must always be remembered that carbon bi-sulphide gas is poisonous and highly inflammable; care must be taken therefore not to inhale the fumes or to bring an exposed light into its near vicinity.

One farmer who has recently tested this method of seed treatment reports it to have been entirely satisfactory. It is probable that once sprouting is commenced it should be further accelerated by placing the tubers in a slightly heated tobacco barn in which a reasonable amount of humidity is maintained.

# Reviews.

## PLANT DISEASES.

*By F. T. Brooks; viii.-386 pp., 62 figs. Oxford University Press,* 1928. 21s.

This is a very complete account of diseases of crops caused by fungi, bacteria and viruses and is up to date in the information which it contains. It appears to be written chiefly for students of phytopathology in Great Britain, but concise summaries are given of a number of diseases of crop plants likely to be encountered by a mycologist overseas, and these should prove useful both to the student pre-

paring for a colonial appointment and the already established isolated worker.

The diseases are arranged according to the systematic position of the pathogen, and not, as is usually found in books of this nature, under the host plants. Non-parasitic and virus diseases are first dealt with in two chapters. These contain useful short descriptions of the principal symptoms exhibited by affected plants, and the author then proceeds to work through the bacteria and lower fungi to the Agricales, leaving three chapters for consideration of the Fungi Imperfecti. A short chapter deals with diseases caused by green algæ, one affection only, red rust of tea, being described; and the final chapter gives an account of the most common fungicides now in use.

An interesting feature of the book is that all the illustrations are new, and the author must be complimented on excluding a number of stereotyped diagrams which one has been accustomed to associate with works of this nature. The text is necessarily condensed, but full bibliographical references are given at the end of each chapter. The type is clear and printed on paper of excellent quality, the whole being bound in a serviceable cover of blue cloth. The book brings together much of the information on diseases which has been accumulated since the last edition of Massee's text book, and will be welcomed by the wide circle of students for whom it is written.

J. C. H.

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## SPRAYS AND SPRAYING.

Although there is a Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance on the Statute Book, there have not so far been any regulations published governing the sale and composition of insecticides and fungicides. Any firm can dump into this country a so-called insecticide and sell it, although it may not contain a trace of an insecticidal agent. We are fortunate that this has not happened in the past, and we have to thank the good faith, integrity and technical efficiency of chemical manufacturers and the honesty of the business community for not taking advantage of our laws or lack of them.

The South African subsidiaries of that industrial colossus, the Imperial Chemical Industries, more or less dominate the chemical market in South Africa, yet they push their goods delightfully in the most approved modern style. The third edition of "Sprays and Spraying," a handbook for fruit growers and gardeners, just issued by Messrs. Cooper and Nephews, South Africa (Pty.), Ltd., will be welcomed by orchardist and nurseryman in the country. Well illustrated with photographs and drawings, many of them from official publications, the booklet deals briefly with the more serious pests and diseases of the fruit grower.

The recommendations given are, in most cases, the recommendations of officials of the Union Department of Agriculture; they are sound; the materials are all products of the firm, guaranteed as to purity and composition and to comply with the regulations of the Union of South Africa.

The danger of spraying citrus fruit with arsenical sprays is clearly indicated, and as no safe remedy is as yet known, they refrain from pushing an inefficient product of their own.

Prevention is stressed rather than cure. This has been the cry of the official expert for years, but rarely has his cry been heard, and how often has he been called in too late to remedy a state of affairs which is nearly irremediable. Like the boy scout, "Be Prepared," and keep some of these standard remedies on the farm. In the long run it saves money—so will a perusal of this brochure.

C.

# Movements of New Settlers.

The following new settlers arrived in this Colony during the month of May, 1929:—

F. A. Smit.—Arrived from the Union on 1st May and has acquired private land near Odzi.

C. B. Cockcroft.—Arrived from the Union on 1st May and has acquired land near Hartley.

R. Lunan.—Arrived from New Zealand on 6th May on tour of inspection.

C. L. Knaggs.—Arrived from Great Britain on 8th May and proceeded to Mr. H. D. Rawson, Alderley, Arcturus, for a period of training.

N. L. de Villiers.—Arrived from the Union on 11th May on tour of inspection.

J. G. de Bruyn.—Arrived from the Union on 11th May on tour of inspection.

G. F. D. Green.—Arrived from Great Britain and proceeded to Lieut.-Col. Carpentier, Mazoe Estate.

R. H. Greaves.—Arrived from Union on 14th May on tour of inspection.

Capt. G. H. Strydom.—Arrived from the Union on 21st May and proceeded to Melsetter with a view to acquiring land.

— de Klerk.—Arrived from the Union on 21st May and proceeded to Melsetter with a view to acquiring land.

G. W. Verran.—Arrived from the Union on 21st May and proceeded to Melsetter, where he has acquired private land.

J. S. Gamble.—Arrived from the Union on 22nd May on tour of inspection.

C. Niland.—Arrived from the Union on 22nd May on tour of inspection.

E. W. Ashe.—Arrived from Great Britain on 29th May on tour of inspection.

W. Kay.—Arrived from Great Britain on 29th May and proceeded to Mr. Elsworth, Kubri, Que Que, for a period of training.

T. R. Lunt.—Arrived from Great Britain on 29th May and proceeded to Mr. Elsworth, Kubri, Que Que, for a period of training.

H. Bolle and Son.—Arrived from India on 31st May on tour of inspection.

# Southern Rhodesia Weather Bureau.

MAY, 1929.

**Pressure.**—The mean pressure for the month was low in the south, with 0.017 in. below normal at Mazunga, and high in the north, with 0.013 in. above normal at Salisbury. No large fluctuations were recorded during the month.

**Temperature.**—The temperature of the month was high. The mean temperature varied from 4.3° F. above normal at Melsetter to 2.3° F. below normal at Hartley. The maximum temperature was generally high, varying from 7.6° F. above normal at Tuli to 3.3° F. below normal at Hartley. The mean minimum temperatures were about normal, varying from 5.1° F. below normal at Matopos to 2.6° F. above normal at Melsetter and Vermont. The relative humidity was generally about normal.

**Rainfall.**—An unusual amount of rain was recorded during the month.

RAINFALL.

ZONE A.—

| | |
|---|---|
| **Bubi—** | |
| Bembesi Railway | .44 |
| Judsonia | .14 |
| Shangani Estate | .16 |
| **Bulalima-Mangwe—** | |
| Centenary | .22 |
| River Bank | .06 |
| **Bulawayo—** | |
| Fairview Farm | .23 |
| Keendale | .04 |
| Waterworks | .25 |

| | |
|---|---|
| **Gwelo—** | |
| Brokenhurst | .10 |
| Frogmore | .10 |
| Somerset Estate | .25 |
| **Insiza—** | |
| Orangedale | .20 |
| Shangani | .39 |
| **Nyamandhlovu—** | |
| Gwaai Reserve | .40 |
| Naseby | .03 |
| **Umzingwane—** | |
| Springs | .48 |
| **Wankie—** | |
| Matetsi Railway | .03 |
| Sukumi | .24 |
| Tom's Farm | .28 |

**ZONE B.—**

| | |
|---|---|
| **Belingwe—** | |
| Bickwell | .23 |
| Sovelele | 1.56 |
| Tamba | .60 |
| Wedza | 1.37 |
| **Bulalima-Mangwe—** | |
| Bruwapeg | .19 |
| Edwinton | .27 |
| Fallowfields | .24 |
| Garth | .40 |
| Semokwe Reserve | .24 |
| Tjankwa | .19 |
| Tjompani | .14 |
| **Chibi—** | |
| Mtendelende | .43 |
| Nuanetsi Homestead | .21 |
| Nuanetsi N.C. | .03 |

| | |
|---|---|
| **Gwanda—** | |
| Gwanda Gaol ... ... ... ... ... ... ... ... ... | .81 |
| Mazunga ... ... ... ... ... ... ... ... ... ... | .39 |
| Mtetengwe ... ... ... ... ... ... ... ... ... ... | .22 |
| Tuli ... ... ... ... ... ... ... ... ... ... ... ... | .50 |
| **Insiza—** | |
| Albany ... ... ... ... ... ... ... ... ... ... ... | .38 |
| Filabusi ... ... ... ... ... ... ... ... ... ... | .15 |
| Inyezi ... ... ... ... ... ... ... ... ... ... ... | .14 |
| Scaleby ... ... ... ... ... ... ... ... ... ... | .20 |
| Wanezi Mission ... ... ... ... ... ... ... ... | .12 |
| **Matobo—** | |
| Bon Accord ... ... ... ... ... ... ... ... ... | .25 |
| Holly's Hope ... ... ... ... ... ... ... ... ... | .35 |
| Longsdale ... ... ... ... ... ... ... ... ... | .34 |
| Mtshabezi Mission ... ... ... ... ... ... ... | .14 |
| Rhodes Matopo Park ... ... ... ... ... ... | .28 |
| **Umzingwane—** | |
| Essexvale ... ... ... ... ... ... ... ... ... ... | .42 |
| Hope Fountain ... ... ... ... ... ... ... ... | .30 |
| **ZONE C.—** | |
| **Charter—** | |
| Enkeldoorn ... ... ... ... ... ... ... ... ... | .16 |
| Marshbrook ... ... ... ... ... ... ... ... ... | .31 |
| The Range ... ... ... ... ... ... ... ... ... | .41 |
| **Chilimanzi—** | |
| Beacon Hill ... ... ... ... ... ... ... ... ... | .09 |
| Orton's Drift ... ... ... ... ... ... ... ... | .05 |
| **Gwelo—** | |
| Cross Roads ... ... ... ... ... ... ... ... ... | .21 |
| Delano Estate ... ... ... ... ... ... ... ... | .13 |
| Forestvale ... ... ... ... ... ... ... ... ... | .03 |
| Globe & Phœnix Mine ... ... ... ... ... | .17 |
| **Hartley—** | |
| Balwearie ... ... ... ... ... ... ... ... ... | .10 |
| Carnock ... ... ... ... ... ... ... ... ... ... | .19 |

| | |
|---|---|
| Cromdale ... ... ... ... ... ... ... ... ... ... ... | .50 |
| Eiffel Blue Mine ... ... ... ... ... ... ... ... ... | .28 |
| Elvington ... ... ... ... ... ... ... ... ... ... | .92 |
| Gowerlands ... ... ... ... ... ... ... ... ... ... | .20 |
| Handley Cross ... ... ... ... ... ... ... ... ... | .27 |
| Hartley Gaol ... ... ... ... ... ... ... ... ... | .18 |
| Hopewell ... ... ... ... ... ... ... ... ... ... | .71 |
| Maida Vale ... ... ... ... ... ... ... ... ... ... | .03 |
| Meadowlands ... ... ... ... ... ... ... ... ... | .37 |
| Pulham ... ... ... ... ... ... ... ... ... ... ... | .32 |
| Ranwick ... ... ... ... ... ... ... ... ... ... ... | .14 |
| Sunnybank ... ... ... ... ... ... ... ... ... ... | .08 |

Lomagundi—

| | |
|---|---|
| Argyle ... ... ... ... ... ... ... ... ... ... ... ... | .80 |
| Between Rivers ... ... ... ... ... ... ... ... ... | .13 |
| Citrus Estate ... ... ... ... ... ... ... ... ... | .44 |
| Dartmoor ... ... ... ... ... ... ... ... ... ... ... | .16 |
| Dedsi ... ... ... ... ... ... ... ... ... ... ... ... | .42 |
| Dingley Dell ... ... ... ... ... ... ... ... ... ... | .64 |
| Kashao ... ... ... ... ... ... ... ... ... ... ... ... | .23 |
| Mafoota ... ... ... ... ... ... ... ... ... ... ... | .17 |
| Maningwa ... ... ... ... ... ... ... ... ... ... ... | .32 |
| M'sina ... ... ... ... ... ... ... ... ... ... ... ... | .07 |
| Nyati ... ... ... ... ... ... ... ... ... ... ... ... | .27 |
| Palm Tree Farm ... ... ... ... ... ... ... ... | .40 |
| Renardia ... ... ... ... ... ... ... ... ... ... ... | .29 |
| Romsey ... ... ... ... ... ... ... ... ... ... ... | .43 |
| Silater Estate ... ... ... ... ... ... ... ... ... | .06 |
| Sinoia ... ... ... ... ... ... ... ... ... ... ... ... | .50 |
| Woodleigh ... ... ... ... ... ... ... ... ... ... | .44 |

Marandellas—

| | |
|---|---|
| Rocky Spruit ... ... ... ... ... ... ... ... ... | .47 |

Salisbury—

| | |
|---|---|
| Ballineety ... ... ... ... ... ... ... ... ... ... ... | .29 |
| Botanical Experiment Station ... ... | .33 |
| Bromley ... ... ... ... ... ... ... ... ... ... ... ... | .79 |
| Cleveland Dam ... ... ... ... ... ... ... ... ... | .21 |
| Forest Nursery ... ... ... ... ... ... ... ... ... | .34 |
| Gwebi ... ... ... ... ... ... ... ... ... ... ... ... | .10 |
| Salisbury Agricultural Dept. ... ... | .26 |

| | |
|---|---|
| Sebastopol | .17 |
| Western Commonage | .39 |
| **Sebungwe—** | |
| Wolverley | .34 |

ZONE D.—

| | |
|---|---|
| **Darwin—** | |
| M'gadzi | .22 |
| **Inyanga—** | |
| Juliasdale | 1.82 |
| Rhodes Estate | 1.62 |
| **Makoni—** | |
| Ardlamont | .86 |
| Eagle's Nest | .94 |
| Mayo Ranch | .14 |
| Wensleydale | 1.04 |
| **Mazoe—** | |
| Argyle Park | .06 |
| Bellevue | .37 |
| Bindura | .16 |
| Ceres | .51 |
| Craigengower | .49 |
| Donje | .04 |
| Frogmore | .10 |
| Glen Grey | .06 |
| Kingston | .52 |
| M'gutu | .07 |
| Ruia | .15 |
| Shamva Mine | .11 |
| **Mrewa—** | |
| Montclair | 1.31 |
| Mrewa | .42 |
| Selous Nek | .75 |
| **Salisbury—** | |
| Arcturus | .34 |
| Chindamora Reserve | .47 |
| Goromonzi | .40 |

| | |
|---|---|
| Kilmuir | .13 |
| Meadows | .36 |
| Vainona | .59 |

ZONE E.—

| | |
|---|---|
| **Belingwe—** | |
| Belingwe N.C. | .13 |
| **Bikita—** | |
| Angus Ranch | .22 |
| **Chilimanzi—** | |
| Allanberry | .15 |
| Driefontein | .02 |
| Induna Farm | .05 |
| Mtao Forest | .01 |
| Mukowries | .05 |
| **Gutu—** | |
| Eastdale Estates | .08 |
| Glenary | .24 |
| **Gwelo—** | |
| Partridge Farm | .07 |
| **Inyanga—** | |
| St. Trias' Hill | 1.03 |
| **Insiza—** | |
| Stoneham (Brac Valley) | .40 |
| **Makoni—** | |
| Bude | .13 |
| Craigendoran | .17 |
| Mona | 1.91 |
| Monte Cassino | 1.44 |
| Springs | .44 |
| Whitgift | .46 |
| **Marandellas—** | |
| Bonongwe | .50 |
| Delta | .79 |
| Lushington | .27 |

| | |
|---|---|
| Macheke ... ... ... ... ... ... ... ... ... ... ... | .95 |
| Marandellas N.C. ... ... ... ... ... ... ... ... | .78 |
| Wedza Reserve ... ... ... ... ... ... ... ... | .60 |
| **Melsetter—** | |
| New Year's Gift ... ... ... ... ... ... ... | .30 |
| **Umtali—** | |
| Embeza ... ... ... ... ... ... ... ... ... ... ... | .77 |
| Fairview ... ... ... ... ... ... ... ... ... ... ... | .12 |
| Fern Valley ... ... ... ... ... ... ... ... ... | .27 |
| Odzani Power Station ... ... ... ... ... ... | .92 |
| Park Farm ... ... ... ... ... ... ... ... ... ... | .41 |
| Premier Estate ... ... ... ... ... ... ... ... | .29 |
| Sheba ... ... ... ... ... ... ... ... ... ... ... ... | 2.41 |
| Stapleford ... ... ... ... ... ... ... ... ... | 1.79 |
| Umtali Gaol ... ... ... ... ... ... ... ... | .24 |
| **Victoria—** | |
| Chevenden ... ... ... ... ... ... ... ... ... ... | .01 |
| Clipsham ... ... ... ... ... ... ... ... ... ... ... | .16 |
| Riverdene North ... ... ... ... ... ... ... | .15 |

ZONE F.—

| | |
|---|---|
| **Melsetter—** | |
| Chikore ... ... ... ... ... ... ... ... ... ... ... | .02 |
| Melsetter ... ... ... ... ... ... ... ... ... ... | .89 |
| Vermont ... ... ... ... ... ... ... ... ... | .53 |
| **Umtali—** | |
| Cloudlands ... ... ... ... ... ... ... ... ... | 1.30 |

## Dates of Meetings of Farmers' Associations, Southern Rhodesia.

| Name of Association. | Place of Meeting. | Secretary. | July. | August. |
|---|---|---|---|---|
| | | | 1929 | 1929 |
| Ayrshire—Sipolilo | Various farms | G. H. Cautherley | 13 | 10 |
| Banket Junction | Banket Hotel | A. M. Hutchinson | 5 | 2 |
| Beatrice District | Farmers' Hall, Beatrice | W. Krienke | 25 | 29 |
| Bindura | Bindura Farmers' Hall | W. E. Fricker | 12 | 9 |
| Bromley | Farmers' Hall, Bromley Siding | E. Taylor | 3 | 7 |
| Bubi | Queen's Mine | C. H. Olsen | 9 | 13 |
| Bulawayo Landowners' and Farmers' Association | Library Buildings, Bulawayo | W. A Carnegie | 11 | 8 |
| Chakari | Dodington (June) | L. T. Tracey | 17 | 21 |
| Daisyfield | Somabula (July), Daisyfield (August) | L. E. Edwards | 13 | 17 |
| Darwendale—Trelawney | Various farms | Charles H. Tanner | 24 | 28 |
| Eastern Districts | Farmers' Hall, Chidza | W. E. Richards | 13 | 10 |
| Enkeldoorn | Enkeldoorn | C. N. Ludlowe | 2 | 6 |
| Enterprise | Farmers' Hall | W. Stobart | 2 | 6 |
| Essexvale | Essexvale | Col. D. Judson | 21 | 18 |
| Felixburg—Gutu | Felixburg Store (July), Fairburn (Aug.) | A. J. Bradshaw | 13 | 10 |
| Figtree Branch, R.L. and F.A. | Figtree Hotel | The Secretary | 2 | 6 |
| Gadzema | Gadzema | H. G. M. Liddell | 12 | 9 |
| Gatooma | Speck's Hotel | Col. J. A Smith | 20 | 17 |
| Gatooma (Golden Valley Branch) | Golden Valley Hotel | C. K. James | 13 | 10 |
| Gazaland (South Melsetter) | Farmers' Hall, Chipinga | J. Ward | 20 | 17 |
| Greystone | Quarrie Farm | P. J. van der Walt | 13 | . |
| Gwanda | Lowenthal's Building, Gwanda | N. J. B. Nilson | 20 | 17 |
| Hartley | Hartley Hotel | S. H. Rylett | 13 | 10 |
| Headlands | Headlands | J. A. Eve | | .. |
| Hunter's Road | Hunter's Road | R. W. Twilley | 27 | 31 |
| Insiza South | Farm Lancaster | J. Campbell | 11 | |
| Inyazura | Inyazura | W. P. Frudd | | 2 |
| Lalapansi | Lalapansi | B. J. Ingle | 13 | 10 |
| Lomagundi | Sinoia | F. W. Robertson | 12 | |
| Lomagundi West | Various farms | A. A. Bisset | 14 | 11 |
| Macheke | Farmers' Hall, Macheke | R. O. Jackson | .. | .. |

| | | | | |
|---|---|---|---|---|
| Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association | Various Farms | T. R. Colam | 6 | 3 |
| Makwiro | Makwiro | W. L. Parsons | 19 | 16 |
| Marandellas | Marandellas Farmers' Hall | E. Cruikshank | 5 | 2 |
| Marandellas, Southern | Various farms | B. V. Cherry | 3 | 7 |
| Mashonaland | Mashonaland Farmers' Hall, Salisbury | C. Lamb | 12 | 9 |
| Matobo South | Farmers' Hall, Malundi Farm | A. G. Allan | 20 | 17 |
| Matopo Branch, R.L. and F.A. | Farmers' Hall, Malundi | W. Mirtle | 20 | 17 |
| Mazoe (Concession) | Concession Hotel | A. W. Laurie | 12 | 9 |
| Mazoe (Glendale) | Farmers' Hall, Glendale | James S. Brown | 10 | 14 |
| Melsetter | Court House, Melsetter | J. C. Kruger | 11 | 8 |
| Midlands Farmers and Stockowners | Royal Hotel, Gwelo | T. R. van Rooyen | 10 | 14 |
| Ngezi-Umniati | Harvieston, Enkeldoorn | Miss Harvie | 27 | 31 |
| North Umniati | ——— | J F Eagar | Not | received |
| Norton and Lydiate District | Norton | R D. Palmer | 5 | 2 |
| Nyamandhlovu | Nyamandhlovu | R D. McLean | | |
| Odzi District Farmers | Odzi Hotel | F. H. Burnett | 6 | 3 |
| Poorte Valley | Various places | A. D. Wilson | 20 | 17 |
| Que Que | Offices of the Que Que Sanitary Board | A. A. Ackerman | 20 | 17 |
| Rusape Farmers' Association | Rusape | R. Munch | 6 | 3 |
| Salisbury South | Various farms | P. Linton | 31 | 28 |
| Selukwe | The Hotel, Selukwe | W. T. Simpson | | |
| Shamva | Shamva Court House | W. Stanley Stollard | 19 | 16 |
| Two Rivers Farming Association | Various farms | W. L. Parsons | 20 | 17 |
| Umboe (Branch of Lomagundi F.A.) | Various farms | C. W. S. Ford | 13 | 10 |
| Umvukwe Farmers' and Tobacco Growers' Association | Various ranches | Com. E. Wrightson | 13 | 10 |
| Umtali | Drill Hall, Umtali | A. Howat | 4 | 1 |
| Umvuma and District | Umvuma | S. T. Montgomery | Not | received |
| Victoria | Victoria | G. E. Lamb | 6 | 3 |
| Wankie District | ——— | F. H. Going | Not | received |
| West Umvukwe Farmers' Association | Various farms | G. H. Gordon | 6 | 3 |
| Western | Plumtree Hotel | The Secretary | 13 | 10 |
| Willoughbys | Willoughbys | A. E. Roberts | Not | received |

# Export of Cattle from Southern Rhodesia, 1929.

| Month | Union | | England. | Congo | | N. Rhodesia | Portuguese East Africa. | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Slaughter | | Slaughter | | | | | | | |
| | Johannesburg | I.C.S. for overseas | On hoof | Slaughter | Breeding | Breeding | Slaughter | Trek | Breeding | |
| January ... | 66 | ... | ... | 2,222 | 272 | 12 | ... | ... | ... | 2,572 |
| February ... | 84 | ... | ... | 656 | ... | ... | 12 | ... | ... | 752 |
| March ... | 12 | 1,353 | ... | 1,845 | 1,803 | 19 | 24 | ... | ... | 5,056 |
| April ... | 242 | 1,842 | 75 | 2,933 | 1,131 | ... | 38 | ... | 22 | 6,283 |
| May ... | 224 | 4,318 | 620 | 1,508 | 2,966 | 17 | 24 | ... | ... | 9,677 |
| June ... | | | | | | | | | | |
| July ... | | | | | | | | | | |
| August ... | | | | | | | | | | |
| September ... | | | | | | | | | | |
| October ... | | | | | | | | | | |
| November ... | | | | | | | | | | |
| December ... | | | | | | | | | | |

J. M. SINCLAIR,
Chief Veterinary Surgeon.

# Rhodesian Milk Records.

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| De Grendel Rita | Friesland | 9,034.50 | ... | 330 | W. R. Blackwell, Norton |
| Astralia ... | do | 3.020.50 | ... | 120 | do do |
| Ogden Hall Alberta | do | 4,817 00 | ... | 120 | do do |
| Dunoran Pearl | do | 4,370.50 | ... | 90 | do do |
| Bluff Hill Fancy | do | 5,047.00 | ... | 257 | J. Halford, Banket |
| Bluff Hill Fiona | do | 4,160.50 | ... | 218 | do do |
| Dapple ... | do | 7,159.00 | ... | 300 | A. T. Holland, Chatsworth |
| Rhoda ... | do | 4,749.00 | ... | 270 | do do |
| Boontje of Kaalplaats | do | 4,773.00 | ... | 201 | do do |
| Langton Nessie | do | 4,188.00 | 134.33 | 315 | M. Inge, Sinoia |
| Langton June | do | 5,075.00 | 151.93 | 304 | do do |
| Langton Daisy | do | 3,980.00 | 138.25 | 263 | do do |
| Palm Tree Violet | do | 3,043.00 | 71.93 | 154 | do do |
| Palm Tree Buttercup | do | 3,072.00 | 67.75 | 147 | do do |
| Erin-go-bragh Anne | do | 6,203.50 | ... | 270 | W. Mitchell, Iron Mine Hill. |
| Freesia ... | Grade Friesland | 5,061.75 | ... | 270 | C. E. Strickland, Shamva. |
| Kate ... | Grade Shorthorn | 5,689.50 | ... | 330 | do do |
| Geranium ... | do | 4,101.75 | ... | 210 | do do |
| Jacanda ... | do | 1,465.75 | ... | 60 | do do |
| Sally ... | Grade Friesland | 2,150.75 | ... | 120 | do do |
| Betty ... | do | 1,433.50 | ... | 60 | do do |
| Groenvlei Bed-ford Alberta | do | 10,896.75 | ... | 330 | P. T. Webb, Iron Mine Hill. |
| Sheeprun Duchess | do | 1,863.50 | ... | 60 | do do |
| Gertie ... | do | 2,375.50 | ... | 90 | do do |
| Melrose Hetta | Friesland | 3,595.00 | 126.30 | 60 | Government Farm, Gwebi |
| Gwebi Princess | do | 2,183.00 | 78.12 | 60 | do do |
| Mimosa Stienser | do | 1,791.50 | 60.34 | 60 | do do |
| Fanny ... | Grade Friesland | 3,225.50 | 106.32 | 60 | do do |
| Katie ... | do | 2,778.50 | 62.13 | 60 | do do |
| Lucy ... | do | 2,355.50 | 76.02 | 60 | do do |
| Kleinbloem ... | do | 1,217.00 | 39.79 | 30 | do do |
| Gwebi Klein-bloem | do | 1,097.50 | 36.43 | 30 | do do |
| Hannah ... | do | 1,674.50 | 43.53 | 30 | do do |
| Gwebi Lucy ... | do | 1,197.50 | 34.09 | 30 | do do |
| Gwebi Water-bloem | do | 1,010.50 | 29.02 | 30 | do do |

# Farming Calendar.

## July.

### BEE-KEEPING.

The warmer bees are kept during this month so much the stronger will they come out in the spring. Provide a thickness of 3 inches of cloth coverings over the frames, and where quilts are, on examination, found to be damp, replace them with dry ones. This is a favourable season to carry out repairs to hives. All section and shallow frame combs must be carefully stored away from ants and mice, as these will be wanted for the excellent honey to be stored in them next October, collected from the bush bloom.

### CITRUS FRUITS.

Mid-season oranges should be harvested and marketed this month; late varieties should be fit to export by the middle of the month. The dead wood should be broken and cut out of all harvested trees; this will minimise mechanical injury occurring with next season's fruit. Trees that are to be fumigated should have the lower lateral branches that touch the soil removed. Trim the trees until all foliage is just clear of the ground. The irrigation of late varieties must be continued and the cultivators kept going. Mark all trees when in fruit if the quality is bad; these may be cut back in August for top working to a good quality fruit. The soil of the early and mid-season varieties may be allowed to become fairly dry, for irrigation of the harvested trees may start an out-of-season growth which will enable pests to flourish and increase for the main spring blossoming flush.

### CROPS.

Support agricultural shows, and add to your list of exhibits. Advertise your goods through the shows. Interested people will see them. If you require to make purchases of seed for next season, judge by the exhibits on the show what grower can best supply your needs, and place your orders accordingly. Attend the shows and go there to learn all you can about your business, not merely to have a good time. Seed maize previously selected in the field should be butted and tipped and hand shelled. Keep the butt and tip grain for check-row planting by hand. Do not over-irrigate winter crops, and do not irrigate when the wind is from the south, as this often means frost at this time of year. Troublesome weeds, such as darnel grass or drabok, may be removed from cereal crops by hand. Ploughing should be pressed on with, and maize stalks and roots of maize and other trash from the crop should be collected and burned very thoroughly. A land littered with unburnt and unrotted stalks and roots cannot be brought to a suitable tilth for planting and subsequent cultivation. Silage and sweet potatoes and other succulent feeds will have come into general use now, the potatoes being lifted from the land as required. The application of phosphatic fertilisers which are to be ploughed or harrowed in can be begun. Take the opportunity, during this and the next month

or two, of inspecting all boundary and paddock fencing and gates, and effect repairs where required. Give a coat of paint to implements, wagons and carts. This protects the woodwork from rotting and the iron from rust.

## DAIRYING.

This is one of the coldest months of the year, and milk production as a rule is low. Those cows which are being milked should receive a full winter ration of succulents (ensilage, pumpkins or majordas), hay and concentrates. Milking cows should either be under shelter at night or kraals should be sheltered against cold winds. The old adage, "Shelter is as good as a meal," should be remembered throughout the winter months.

No difficulty should be experienced in producing first-grade cream at this time. In cold, windy weather due precautions should be taken to ensure that the milk when separated is not below 90 degrees.

Most cheese-makers cease their cheese-making operations at the end of the month, as the milk generally not only is scarce, but begins to be deficient in butter fat. Cheese in the store-room should be carefully watched, as cheese mite is likely to appear on old mature cheese. In order to prevent the undue drying out of the cheese, the floor of the cheese room should be sprayed with water from a watering can.

Butter-making is sometimes difficult because of the low temperature of the cream. The temperature should be raised by immersing the can in warm (not hot) water until churning temperature is attained.

## DECIDUOUS FRUITS.

Pruning must be continued, and if possible completed this month. The planting of all varieties is best if done now. Add a liberal amount of water at planting time, then cultivate the basins. Sufficient moisture will be thus retained to keep the newly planted trees going until they start active growth. Repeat waterings when necessary. If trees arrive from the nurseryman in a dry and withered condition, immerse them in water for twelve or more hours until they regain turgidity; then plant. Running water is best. Keep cultivators going. It will be advisable to irrigate all trees towards the end of the month.

## ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during July.

Onions suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

Maize Beetle.—Infested lands to be thoroughly ploughed throughout the winter.

## FLOWER GARDEN.

Seeds of most annuals, perennials, shrubs and ornamental trees may be sown. The pruning of roses should be attended to early. Dahlias and other summer-flowering bulbs should be taken up, divided and replanted. Sweet peas require attention and staking.

## VEGETABLE GARDEN.

Sow turnips, beans, peas, onions, cabbage, beet, carrots, parsnips, radishes, lettuce and spinach.

## FORESTRY.

Care should be taken to protect all plantations from fire by hoeing belts round them and burning any grass likely to be dangerous. Cuttings of various deciduous trees may be taken and struck in nurseries. Continue pricking out conifers into tins or beds. In preparation for early planting in case the season is favourable, limited sowings of tree seeds may be carried out. If labour is available, preparation of land for planting to be taken in hand.

## GENERAL.

Veld fires must be watched for and arrangements made to combat them. The loss that may result and the penalties under the Herbage Preservation Ordinance are to be borne in mind. Fire guards should this month be burnt round all grazing which it is desired to preserve for use later on.

## POULTRY.

With the cold weather that we generally have in July, the birds should have extra food, i.e., barley or maize, if the supply of eggs is to be continued, for they need most of the food that previously went to manufacture eggs, to keep up the body heat. A mixture of stewed linseed and bran should be given to the birds, warm, the last thing before they go to roost. This gives them a little extra food during the long and cold hours of the night at this time of the year and maintains the body heat. A certain amount of shelter is also necessary to protect them from the cold winds. Grass wind breaks about 3 feet high on the windward side of the run are sufficient. Remember that no chickens should be hatched after August; those hatched later take much longer to develop than those hatched before August, and they are usually stunted, weakly and unprofitable. Each month the young stock should be gone through and graded; anything that does not promise to be good should be got rid of. We want quality rather than quantity. As the hatching season draws to a close, the breeding stock, if not carefully watched and treated, will become run down, and infertile eggs and weak chicks will be the result. Watch the breeding stock carefully and handle them occasionally; if they feel thin and light or the flesh is not hard but flabby, give extra food and more scratching exercise. The male especially should be well looked after and given a meal on three or four days of each week by himself; in addition, he should have some raw meat as often as possible. Good hatching and strong, healthy chicks are wanted right up to the end.

Turkeys should now be in full lay. Never disturb the hens when they are sitting. They are very sensitive and nervous, and unless left mainly to themselves, are apt to desert the eggs or break them. It is recommended that turkey chicks be reared by hand; the hens are poor mothers, they are clumsy, drag their chicks all over the place, and do not feed them as well as an ordinary hen does. The main thing is to keep the young turkeys warm, give them plenty of fresh air, thick separated milk and chopped onions or onion tops.

## STOCK.

Cattle.—On ranches the advice given for June applies still. The bulls may again be put into the herd at the end of the month. If grazing has been reserved for the winter months, it will probably be wise to turn the cattle into it now. Watch for any unthrifty cattle, and get them into the home paddock and feed them before they become really poor.

Sheep.—Vleis should now be fairly dry and may be utilised; otherwise the advice given for June applies.

## VETERINARY.

Horse-sickness and blue tongue should now have disappeared. Redwater and gallsickness occur all the year round, but the worst time is during the summer, when ticks are prevalent. Sheep may be inoculated against blue tongue now. Scab in sheep will probably be in evidence this month.

### WEATHER.

Though rains have fallen during every month of the year in Rhodesia, none is looked for or desired this month. Most stations record an average of .01 to .3 inch over a number of years. Severe cold is likely to occur at this time of year, the lowest temperatures occurring an hour or two before sunrise. Frosts may be looked for, especially on calm clear nights. Cold windy days and damp "guti" weather tell severely on cattle, if shelter and food are not provided.

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## August.

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### BEE-KEEPING.

This month is one of inaction as far as the apiarist is concerned and the hive inmates are best left alone, except that once a week a corner of the quilt on the top crate may be lifted to see if the wax moth has gained a footing, as may easily be the case in a colony weakened by death from sundry causes, and in which case all such frames should at once be removed. Towards the end of the month, with warmer weather, the bees will be tempted out for play spells, cleansing flights, etc., and, according to the season, entrance stops may be opened out slightly with advantage.

In the workshop see that a spare hive or two are in readiness, well painted and ready for use at any hour; also have in readiness any requisite spares, and see that all appliances, such as veil, smoker, fuel, etc., are handy, for swarms may now go and come at a few minutes' notice. Where the bees have been left to their winter quarters with a fair supply of food, good results can confidently be looked forward to for the coming honey flow of the early winter weeks.

### CITRUS FRUITS.

The first or spring growth should commence about the middle of the month, and the trees should have a good soaking of water when the new growth commences. If Washington Navel oranges are to set their main crop, frequent irrigations must take place from the time of blossoming up to the rainy season. These irrigations create the necessary humid conditions which are so essential to secure a satisfactory setting of this orange. It is advisable to stimulate the growth of unthrifty trees with an application of one to one and a half pounds of nitrate of soda when the first irrigation is given, this application of fertiliser to be followed by good cultivation. The amount of fertiliser recommended is for mature trees. The packing of late varieties will continue throughout the month. No bearing trees should suffer for want of moisture. Irrigation should not take place immediately before the harvesting of export fruit—at least ten days should elapse between irrigation and the harvesting. This is the best month to cut down citrus trees for re-working to better varieties. As the citrus trees are harvested, all dead, diseased and broken branches and shoots should be carefully cut out before the trees come into new growth.

### CROPS.

If not already marketed, the main potato crop will probably be sold about now. Do not forget to grade the potatoes properly according to size. The buyer wants potatoes—table or seed—of even size, not large and small indiscriminately mixed. Select and clean farm-grown seeds ready for next season's planting. Label the bags with name and weight of contents.

Build a proper shed for your seed potatoes on the lines recommended in the *Rhodesia Agricultural Journal*. Sort over seed potatoes in store and remove any diseased or rotten. Green oat or barley fodder on wet vleis, or under irrigation, will become ready for cutting. Press on with ploughing and cross-ploughing. Decide what crops are to be grown next season, and, if you think fit, discuss the matter with officers of the Department of Agriculture. If you have not already effected all your purchases, consider the question of what seed you will require to buy for next season, and discuss the matter with other farmers. If in doubt, consult the Department of Agriculture. In frost-free situations, potatoes can be planted for an early crop under irrigation or on damp land. Cart and spread your farmyard manure and plough it under as soon as spread to avoid loss. If you have any long stable manure, apply it to your heaviest land. The application of phosphatic fertilisers to the land can continue. If you do not already have one, put up an implement shed, even if it be only poles and grass. Keep wagons and Scotch carts under a similar shed or in the shade of trees. Speed up the making and burning of bricks if this is still in progress.

## DAIRYING.

At this time of the year the farmer should experience very little difficulty in producing cream of first-grade quality. As a rule the weather is sufficiently cold to prevent cream, produced under average conditions, from undergoing rapid deterioration, and it is not usually necessary, therefore, to separate a cream of such high butter fat content as is required during the warmer months of the year. During the winter months the separator should be adjusted so as to deliver cream testing 40 to 45 per cent. butter fat.

On exceptionally cold days care should be taken that the milk is not allowed to become too cold before separation—for efficient skimming, the milk should be separated immediately after milking and at a temperature not lower than 90 degrees F.

Farmers engaged in butter-making are usually successful in obtaining a good grain and firm body in butter at this season of the year. Cream can quite easily be cooled to churning temperature if placed outside the dairy and exposed to the atmosphere overnight. During cold weather, however, it is more frequently necessary to warm the cream for churning. The most satisfactory method of warming the cream to the proper churning temperature is to place the bucket or receptacle containing the cream in a tub or bath of water at a temperature of about 95 degrees F., stir the cream frequently and replace the water when cold.

This is usually a critical time of the year for young dairy stock. For dairy heifers, weaned calves, etc., there is possibly no better ration than one consisting of maize silage, legume hay and mixed concentrates, and these feeds, if supplied in liberal quantities, should serve to keep the young stock in a thrifty, growing condition.

## DECIDUOUS FRUITS.

All plantings of deciduous trees should be completed by now, as the late planting of these trees is generally unsatisfactory. Pruning may be continued up to the middle of the month. It is advisable to water or irrigate all deciduous trees before blossoming; if possible, a second irrigation should be given after the trees have set their fruit. Follow up the irrigations with good cultivation.

## ENTOMOLOGICAL.

**Potato.**—Early planted crops of potatoes may be attacked by caterpillars. The crops should be sprayed immediately with an arsenical wash.

**Cabbage Family.**—Young plants of this family should be kept sprayed with an arsenical wash to check attack by webworm. Do not spray plants of which the foliage is to be eaten within three weeks of use.

**Onion.**—May still be troubled with thrip. Use tobacco wash or paraffin emulsion.

**Citrus Trees.**—May be sprayed or fumigated against scale insects, having regard, however, to presence of fruit and blossom. Spraying and fumigating for scale should not be carried out whilst trees are in blossom. Clear young growth of aphis previous to blossoming, using nicotine, tobacco wash or Derris.

**Guava.**—Collect and destroy remnants of late crops to keep down citrus codling, especially if trees are in vicinity of citrus orchards.

## FLOWER GARDEN.

Complete digging or forking over the soil as early as possible. Divide and replant dahlias, delphiniums, Shasta daisies, etc. Plant bulbs—tuberose, arum lilies and gladioli. Sow seeds of hardy annuals. Mulch newly-planted roses, shrubs, etc.

## VEGETABLE GARDEN.

Plant out asparagus, cabbage, cauliflowers, onions and early potatoes. Sow seeds of tomato and other plants that are susceptible to frost in a sheltered position; also seeds of various vegetables and salads for summer use.

## FORESTRY.

Cuttings of ornamental shrubs, roses, etc., struck in sand last month should be transplanted into good soil as soon as they show a good healthy growth of leaves. A large percentage of cuttings will damp off if left in sand longer than about six weeks. No manure should be added to the potting soil. Seed beds should be prepared and gum seeds sown if required for planting early in the season. If the trees are to be grown in seed beds only and not in tins, then gum seeds should not be sown until October, or later, as they will get too large.

## GENERAL.

Fire guards should be completed and every precaution taken to guard against loss of grazing from fires. Natives commence ploughing their softer land this month, and for this reason, as well as because beer is plentiful at the kraals, local labour is apt to be scarce. At this time of the year, however, the need for boys on farms is not so severely felt as later on.

## POULTRY.

By the end of this month all those who are not able to give much attention to the chicks while in the growing stage should have stopped hatching. Those who can give some extra care, can continue hatching for another month, but not later, for chicks hatched after August are usually slow in growth and weedy. They do not lay till some months after they should, and eggs are few in number; in fact, they are generally unprofitable.

Now that the hot weather is approaching, a constant war on insects must be carried out, and of these sand fleas and fowl ticks (erroneously called tampans) will be found to be the most troublesome. A bulletin on fowl ticks can be obtained upon application to the Poultry Experts, Department of Agriculture. Sand fleas, as most poultry keepers know, are found on the face, wattles, ear-lobes and combs of the birds. Application of carbolised vaseline will usually kill them at once, or two or three applications of any ordinary grease on successive days are efficacious. More than this is, however, necessary, for the breeding quarters of these insects (and they multiply very rapidly) are in the dust on the floor of the house and that of the run.

The best preventive is a hard floor (preferably of concrete) with no cracks. If this is not possible, the floor and around the house should be treated every week in one of the following ways:—(1) Thorough soaking with a solution of one teacupful of Kerol, Jeyes, Hycol, Izal, or similar

disinfectant to a paraffin tin of water, or (2) with a strong solution of salt and water, or (3) dusting over and raking into the soil a mixture of one part flowers of sulphur and two parts finely powdered lime.

Ducks.—See that the breeding ducks have plenty of water, and if possible also some to swim in. Keep young ducklings out of the hot sun, otherwise there will be many deaths. The same applies to geese and goslings.

Turkeys.—Young turkeys must be protected from cold at night, for this is fatal to them. Give them as much free range as possible, and do not allow them to run round the house or on the same ground as fowls do. Turkeys like clean ground; any that is tainted is very detrimental to them. Let them find most of their food in the bush.

## STOCK.

Cattle.—On the early granite and sand veld probably the worst of winter is over so far as grazing is concerned, and a nice bite of green grass is appearing. Care should be taken where cattle are allowed to graze on the early burnt grass not to let them get too much at first. On red soil farms the haystack will still be required, and in all cases a certain amount of hay or ensilage should be held in reserve against the possibility of very late rains. The bulls may again be put back into the herds. Any very young calves should be kept near home, and dipping should be carefully attended to. In dairy herds on any soil whatever, feeding, housing and bedding cannot be relaxed. Cows in full milk will benefit by a ration of, say, 5 lbs. of maize (crushed and soaked), 30 lbs. to 40 lbs. of ensilage or pumpkin and 8 or 10 lbs. of hay. If it is possible to give, in addition to the above daily ration, 2 lbs. of peanuts, crushed with the shell, or linseed ground with maize, or oil cake, a very great benefit will be derived. Calves, especially young ones, must be carefully watched; they should not run too far, and are better inside, except when the weather is warm. It will pay to feed to them a little sweet hay, bean meal, linseed, peanuts or peanut cake and a small ration of green food.

Sheep.—Sheep should give little trouble at this time of the year, but on very dry veld a handful of mealies and a little hay or ensilage will materially assist ewes with young lambs.

## TOBACCO.

The seed bed site should be cleared and well ploughed, preparatory to burning and sowing. The usual date of sowing the first beds is the 15th September. Bulletins covering every phase of tobacco culture can be had upon application to the Editor.

## VETERINARY.

Redwater and gall-sickness occur all the year round, although these diseases are more prevalent during the summer months. A good many deaths occur this month, however, amongst imported stock. Vegetable poisoning will probably be in evidence. Sheep can be inoculated against blue tongue. Scab is a poverty winter disease.

## WEATHER.

No rain is to be expected, and even on our eastern mountains the precipitation is trifling. Showers, however, do occasionally fall in places, but are of no consequence. The sun is often warm during the day, but the nights are apt to be cold, and grazing being scarce, food and shelter are necessary for the stock.

# Notes from the "Gazette."

| "Gazette" Date. | Items. |
|---|---|
| | POUND. |
| 24.5.29. | A pound has been established at Shankuru Farm, Banket, as from 1st June. (G.N. 318.) |
| | AFRICAN COAST FEVER. |
| 24.5.29. | Government Notice No 320 declares the native districts of Melsetter and Mazoe to be actively infected with African Coast Fever for the purposes of the "Animals Diseases Amending Ordinance, 1911," which gives the Government certain powers in regard to fencing and the erection of dipping tanks. |
| | AFRICAN COAST FEVER |
| 31.5.29. | Government Notice No. 298 of 1929 is cancelled, and in terms of section 15 of Government Notice No. 641 of 1927, the following areas of infection and guard area are declared in lieu thereof :— |
| | NATIVE DISTRICT OF MAZOE. |
| | (a) *Areas of Infection.* |
| | 1. The farm Richlands. |
| | 2. The farms Grey and Mari Plumbi (Nos. 40 and 41, Glendale). |
| | (b) *Guard Area.* |
| | An area bounded by and including the Chiweshe Reserve, Audrey, Clutton, Lilstock, Chumbere, Crewkerne, Dimitra, Hinton, Maparu, Lagnaha, Dunaverty, Chomkuti, Dundry, Brockley, Makori, Dunmaglas, Irenedale, Longcroft, Geluk, Hillymead, Farms 28 and 27, Glen Grey, Umzi, Protea, Farms 14, 15, 18 and 19, Hermiston, Farms 30 and 33, Mazamba, Ndiri East, Ndiri, Ndiri South, Nyachura, Banff, Tekke, Arda, Hasfa, Frogmore, Frogmore Extension, Remainder of Umvukwe Estate, including Elsinora and Forrester Estate, Goveti Ranch and Chipiri. |
| | LOANS FOR IRRIGATION WORKS. |
| 7.6.29. | Government Notice No. 347 details the conditions under which loans for irrigation works may be obtained. |
| | AFRICAN COAST FEVER. |
| 14.6.29. | The following area of infection and guard area are declared in terms of section 15 of Government Notice No. 641 of 1927 :— |
| | NATIVE DISTRICT OF CHARTER. |
| | (a) *Area of Infection.* |
| | The farm Victor. |
| | (b) *Guard Area.* |
| | An area bounded by and including the Hampshire Estate, Mangeni Reserve, the farms Reserve, Norah Lee, Galts, Standish, Gisbornes, unnamed farm, Allandale, Troon, Glentoval, |

Range A, Spurwing, Range B, Inkosi, Rockydale, Swartfontein, Singlethorn, Strathuisque, Brabant's Farm, Highover and Wittendale.

BRANCH ROAD.

14.6.29 The following has been approved as a branch road :—

From the crossing of the south-west boundary of Copleston (portion of Redbank A) giving access to the Bulawayo-Nyamandhlovu road, across The Ranch; thence along the south-west boundary of Copleston, within Copleston; thence in a north-easterly direction across Copleston to a point on the north-east boundary of Copleston; thence across the farm Goodmayes (portion of Redbank A) to the homestead on Goodmayes.

# Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

## AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
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No. 601. Maize for Export, by S. D. Timson.
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THE RHODESIA

# Agricultural Journal.

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## Editorial.

*Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.*

**Pan-African Agricultural and Veterinary Conferences.**—Readers will be pleased to know that this Colony is to be represented at these conferences, which are to be held at Pretoria from 1st to the 17th August. The officials who will attend are the Acting Secretary, Department of Agriculture (Dr. Brain), the Chief Agriculturist, the Chief Entomologist, the Chief Chemist, Assistant Chemist, the Chief Veterinary Surgeon and the Research Officer of the Veterinary Laboratory. Delegates will be present from Great Britain, Egypt, Madagascar, Mozambique, Tanganyika, Sudan, Uganda and, of course, the Union of South Africa. The delegates from Great Britain will be Sir A. D. Hall, K.C.B., F.R.S., Chief Scientific Adviser; Dr. W. H. Andrews, M.R.C.V.S., Director of Veterinary Laboratory; Major

Walter Elliott, M.C., Chairman of the Research Grant Committee of the Empire Marketing Board, and possibly one other delegate, together with a member of the Secretariat. The main headings of the subjects to be discussed at the Agricultural Conference are Rural Sociology and Agricultural Economics; Agricultural Education, including Extension Services; Animal Husbandry; Plant Industry; Chemistry and Soils. Each of these is sub-divided into a number of sections, so that the sum total of subjects on the agenda cover practically every phase of agriculture as practised in the African continent to-day. The agenda of the Veterinary Conference also includes a very wide range of subjects, while there will be joint sessions at which matters affecting stock and agriculture will be discussed.

This meeting of scientists who have made the study of problems peculiar to the African continent their life work is an event of the utmost importance, and we feel sure that the interchange of ideas and experiences which will result will help materially in the advancement of the pastoral and agricultural industries upon which the prosperity of the community so much depends.

**Queer Rock Formations in Rhodesia.**—The imposing structure illustrated on the opposite page is not the concrete foundation for the Tower of Babel, but a natural mass of granite which has been left isolated by the weathering of the surrounding rock. In view of the fact that formations similar to those illustrated are common throughout the granite areas of the Colony, it may be of interest to describe briefly the process of weathering as explained by the Geological Survey Department.

Granite slowly breaks down to form sand and clay whenever it is kept damp beneath a covering of soil. Water works down through cracks in the granite and decomposes it. This causes the granite to swell slightly, and in turn to form more cracks. The weathered rock changes to soil, and the soil is carried away in time by rain and wind. So the process goes on. The exposed surfaces of the rock, however, dry rapidly and are consequently attacked very much more slowly by weathering agencies. The principal cracks in the granite were probably

Granite boulder near Banket. The size of the rock can be judged by the persons to the right.

Granite boulder in the Lomagundi district. (See Editorial note.)

formed when the rock first cooled from the molten state in the dimmest ages of the past. The main mass of the rock in this illustration escaped cracking then, and has remained uncracked ever since. All that the weather has been able to do so far has been to round the surfaces; but it will win at the end.

The second illustration shows a bun-shaped boulder, produced by the same process of weathering, aided by the varying heat of the sun. Expansion and contraction of the surface of the rock, while the interior remains at a constant temperature, causes the rock to break away in scales. Slight angles or ridges on the surface of the rock are places of weakness where the rock scales most readily. The result is a tendency towards the spherical form shown in the illustration.

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**Stock and Produce Dealers Licensing Act, 1929.**—This Act, which was passed at the recent session of the Legislative Assembly and has since been promulgated in the *Government Gazette* of 5th July, repeals the "Native Cattle Dealers Licensing Ordinance, 1920," the "Native Cattle Dealers Licensing Amendment Ordinance, 1921," and the "Native Cattle Dealers Licensing Ordinance Amendment Act, 1924." Under the provisions of the new Act no dealer, other than the holder of a general dealer's licence or a European farmer, may buy stock or produce from a native or deal in any way with stock or produce belonging to a native unless he is in possession of a licence authorising him to do so. Further, no dealer may employ a native for a similar purpose unless he is in possession of a licence. The following definitions are given in the Act:—

"dealer" shall mean any person who carries on the trade or business of buying or acquiring by barter, exchange or otherwise stock and produce as herein defined;

"native" shall mean any aboriginal native, and shall include any person of mixed race living as a member of a native community;

"produce" shall mean the skin or hide of any stock as herein defined;

"stock" shall mean the male, female or young of any kine, sheep or goat.

The licences, the cost of which is not to exceed £10, are issued by the Native Commissioner of the district in which it is proposed to buy stock, skins or hides. A licence is valid only in the district for which it is issued unless endorsed for use in another district by the Native Commissioner of the last-mentioned district. A licence is available for twelve months, but in the case of a dealer employing a native for the purpose of buying stock or produce from natives it is liable to cancellation at any time at the discretion of the Native Commissioner. The penalty for a dealer contravening the terms of the Act is a fine not exceeding £50, or in default imprisonment for a period not exceeding six months. The native employed in buying stock, etc., must produce his licence when required to do so by a member of the police force, Native Commissioner or Assistant Native Commissioner, and the penalty in this instance is a fine not exceeding £10 or imprisonment not exceeding one month.

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**Legislation Affecting Forestry in Southern Rhodesia.**—During the recent session of Parliament three important Acts were passed dealing with aspects of forestry.

*Land Apportionment Act No. 18 of 1929.*—Under this Act an area of 590,500 acres, situated in the Nyamandhlovu, Bubi and Wankie districts, has been set aside for forestry purposes. Both Europeans and natives may be permitted to occupy land within the area on such terms and conditions as the Governor-in-Council may prescribe. For the most part the area consists of Kalahari sand, on which such valuable trees as Rhodesian teak (*Baikiœa plurijuga*), Rhodesian mahogany (*Copaifera coleosperma*), mukwa or bloodwood (*Pterocarpus erinaceus*) are well represented and attain large dimensions. A concession granted to the Rhodesia Native Timber Concessions, Ltd., confers rights to cut timber over portions of the reserve, but as areas are cut over all rights cease, and steps are being taken to protect the young re-growth.

*Land Tax Act Amendment Act No. 30 of 1929.*—The original Act 22 of 1928 contained no provision to exempt from taxation land containing indigenous timber which was being protected by the owner. The new Act provides for exemption

of "land declared by the Minister to be indigenous forest land and in respect of which the owner is taking such measures as shall from time to time be approved by the Minister for the protection and conservation of trees, wood and arboreal products, or for the prevention of erosion or for the conservation of water supplies."

This is a very important provision and enables an owner of land to obtain direct benefit of any work he may do to protect the indigenous trees and other vegetation, particularly on the catchment areas where his water supply is situated. Areas subject to erosion when given protection will in many cases reclaim themselves. The new provisions should be of interest to the Arboricultural Association.

*Native Reserves Forest Produce Act No. 36 of 1929.*— This is an Act to regulate forests and forest plantations on native reserves. Provision is made for the prohibition of cutting or destruction of forest produce where this is necessary in the interests of the inhabitants of a reserve. Provision is also made for the establishment of plantations of trees, with ample safeguards for their protection and proper use. Certain trees are specially protected, and where there is an abundance of timber it can be sold and the revenue credited to the Native Reserves Trust Fund.

The new Act puts the whole forestry question as it affects native reserves on a sound basis, and when administered in a sound and sympathetic manner will be a great benefit to the natives, who will be assured of ample supplies of wood for all their needs.

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**Cotton.**—We direct attention to the notice which is published elsewhere in this issue of the Journal inviting applications for supplies of U. 4 cotton seed. It will be noticed that the issue falls into two categories, the one being seed for commercial planting, and the other selected U. 4 seed for bulking up purposes. It should also be noted that applications for seed should be made to the Cotton Specialist before the 1st September. We might mention that with the spacing which is recommended for the U. 4 variety, about 7½ lbs. of seed will be required to plant an acre. For the benefit of those farmers who have little or no knowledge of the growing

of cotton, we have arranged for the publication of an article on the subject in the next issue of the Journal. This article will be written by Major Cameron of the Empire Cotton Growing Corporation, and will be reprinted in bulletin form later. It is pleasing to record that in spite of severe bollworm attacks and unfavourable weather conditions, the results obtained in the field with U. 4 cotton last season have been very encouraging.

With knowledge of our experiences in this Colony in attempting to grow cotton on a commercial scale, it is of particular interest to turn to a report which we have just received from the Empire Cotton Growing Corporation, in which is recorded briefly the results obtained in other parts of the Empire. There we see that difficulties similar to which we have experienced here have been encountered elsewhere, and in various instances successfully overcome. The position to date in regard to this great movement to render the Empire independent of foreign cotton is epitomised by the Rt. Hon. the Earl of Derby at the eighth annual meeting of the Corporation held in June in the following words:—"Up till now the chief pre-occupation of your Executive has been spade work and the digging of foundations. Though that is not yet completed, I believe that the ratio of actual increase will be greater during the coming five years than it has been in the past, gratifying though that has been."

Examination of a table published at the end of the report submitted to the meeting in question shows that in the year 1927-28, 355,638 bales of cotton of 400 lbs. weight were produced in the Empire, exclusive of India. This compares with 360,418 bales in 1924-25, 431,438 bales in 1925-26, and 355,522 bales in 1926-27. Excluding India, the greatest producer of Empire cotton is Uganda, which in 1927-28 was responsible for 138,486 bales, Anglo-Egyptian Sudan coming next with an out-turn of 126,115 bales. Tanganyika occupies third place with 32,965 bales, followed by Nigeria with 20,930 bales, and the Union of South Africa with 11,013 bales.

In the year 1925-26 Southern Rhodesia occupied sixth place in the list of Empire producers of cotton, since when we have fallen to a very lowly position for reasons which are too well known to be enumerated. Experience has proved, however, that cotton can be grown successfully in many parts

of the Colony, and we confidently look forward to the time when our quota will form an important contribution to Empire supplies.

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**A Farmers' Accounting Society.**—A recent number of the Journal of the Ministry of Agriculture gives some particulars of the working of the Wiltshire Farmers' Accounting Society, which was founded in 1925. We draw attention to this scheme, for it appears to us that with suitable adjustment to meet our particular conditions some such organisation might be adopted by groups of farmers in this Colony.

It has been said that accounts in themselves teach nothing, and that only when accounts are intelligently interpreted are they really worth while. This interpretation of accounts is the most important aspect of the work of the Wiltshire Farmers' Accounting Society, and, indeed, was the fundamental reason for its formation. Briefly, the methods adopted are as follows:—The members of the society keep simple accounts of their disbursements and receipts during the year, together with a record of their farm valuation at the beginning and end of each year. The accounts, when completed by the farmer or accountant if need be, are sent to the accounting officer of the society, who works in close touch with the Economics Section of the Agricultural Department of the University of Bristol. The society's officer, upon receipt of the accounts, dissects and analyses them. The results are then tabulated for each farm and are sent, with a brief report, to the individual farmer concerned. By means of such reports the attention of the farmer is called to any class of income or expenditure that appears to be abnormal. For instance, the relation between output and expenditure incurred in its production is examined, differentiation being made between prime and secondary costs. The proportions of total prime or production costs absorbed by such items as wages, manures and foodstuffs are also considered, with the object of ascertaining whether a better balance between these items might not be possible. The individual farmer is, of course, the person who decides whether the suggestions or recommendations made to him are worth acting upon. No two farms are alike, yet it is often possible for the onlooker, "who sees more of the game," to indicate where improvements may

be made. Thus, a farmer may feel quite satisfied either with his annual profit, or with his output from the farm, until he finds that other similar farms are doing considerably better. This is one of the ways in which the society helps the individual. Each member's farm is given a distinguishing number, which is known as a code number. No person, other than that farmer, the advisory economist at Bristol University and the society's accounting officer, can relate any code number to the name and address of the farmer. By this means the confidential and private nature of each farmer's business is strictly maintained. Whenever reference is made to the accounts by the members of the society, the code number only is used. At the conclusion of each financial year the results of all the members are tabulated and a copy sent to each, so that by looking for his code number in these tables a farmer is able to find how he compares with the other members. He may find, for example, that last year his position in order of financial success was nineteenth out of fifty, whereas this year he is twenty-fourth. He does not know the *names* of those who have beaten him, but he knows that his position is relatively worse than in the previous year, and he begins to look round and "to pull himself together" in a determination to beat code number "So-and-so" next time.

But the work of the society does not end with the compilation of tables of results, useful as these are. Every year the members meet at two or three centres in Wiltshire, not only to discuss the tables giving their results, but to consider general problems of farm management, to interchange ideas and to consider the position of agriculture in Wiltshire in relation to that in other counties. The subscription varies from 2s. 6d. to 10s. per annum according to the size of the farm.

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**The International Trade in Beef.**—We are indebted to the University of California for a valuable treatise on the economic aspects of the beef cattle industry from which we have extracted the following particulars, which we believe will be of interest to our readers.

Argentina is the dominant factor in the world trade in beef and beef products, furnishing between 50 and 65 per

cent. of all such exports. Uruguay ranks next to Argentina, contributing about 10 per cent. of the total exports. Australia, New Zealand, Brazil, the Netherlands and the United States make considerable contributions to the export trade.

On the import side, the demands of Great Britain absorb over 60 per cent. of the surplus of the world, while Germany and France combined take an additional 20 per cent. Outside of the countries of Western Europe, Japan and Cuba are the only important importing nations. Imports into the former country have increased rapidly. In 1926, these amounted to 74,694,000 lbs. against an average of 9,002,000 for the period 1911-13. Generally speaking, the world trade in beef and its products was approximately 50 per cent. larger in 1925 and 1926 than it was during the three years 1911-13.

South America has the largest cattle surplus in the world. Between 1909-14 and 1921-25 the cattle population increased approximately 27.5 per cent. Accurate current data on the cattle industry in Argentina are somewhat difficult to obtain. According to the United States Bureau of Agricultural Economics, the present number of cattle is estimated at 30,000,000. The census for 31st December, 1922, gave the number as 37,065,000, an increase of almost 50 per cent. over the pre-war period.

Argentina is by far the largest exporter of beef, particularly of fresh beef. This position has been reached during the last twenty-five years, partly as a result of the decreasing American beef and cattle surplus and partly because of changes in management which have greatly increased its beef surplus. The exports of beef (frozen and chilled) from the Argentine have increased from 27,000 tons in 1900 to 777,000 tons in 1927. The peak year was reached in 1924, when the total was 808,000 tons. Of the total for 1927, 608,000 tons went to Great Britain, creating a record and representing an increase of 34,000 tons over the quantity imported the previous year.

From the standpoint of numbers of cattle, Brazil ranks next to Argentina. The Brazilian movement of beef did not attain importance until the world-war period. Since the war exports of beef have been somewhat erratic, showing no pronounced trend. Live cattle exports, on the other hand, are large, amounting in some years to over a million head.

Brazil has great potential possibilities for the development of the cattle industry and will undoubtedly be a factor which must be reckoned with in the future.

Uruguay is the only other South American country that has as yet exported frozen or chilled beef in large quantities, although Brazil and Paraguay have sent out rather small amounts.

While European production of beef is greater than that of any other equal area of the world, it is the one great area of deficiency in beef and beef products. On account of the war devastations, estimated average yearly totals of cattle were almost 1 per cent. lower during 1921-25 than for the five-year period 1909-14. While France, Germany, Belgium and Jugoslavia showed decreases, most of the other European nations either maintained *status quo* or gained in cattle population. Every indication points to an increase in the number of cattle since the close of the war, so that at the end of 1928 numbers were apparently on a level with the pre-war figures.

In 1927 the cattle population of France had almost reached the pre-war average for 1909-13. France is consuming much more chilled and frozen beef than before the war, imports in 1927 aggregating 121,000,000 lbs., compared with 5,098,000 in 1913. The 1926 figures, however, are considerably below those of 1925 or 1924., This decrease may be expected to continue with the increase in the cattle population, which in 1927 totalled 14,941,000.

Imports of fresh, chilled and frozen beef into Germany during the five years 1923-27 have been many times larger than those in 1913. The increase between 1923 and 1925 was almost 150 per cent. From 1925 to 1927 imports of beef products were almost stationary, but larger numbers of live cattle entered the country. The live stock population has increased considerably in the last few years, and is now 17,983,000, almost equal to the number in 1913. There does not seem to be any reason for greatly increased importations into Germany.

As indicated in a previous issue of this Journal, cattle exports from Canada have now been diverted to the United States. Thus in 1927 the number of cattle and calves sent to the latter country increased to 283,004, while the number sent to Great Britain decreased to 8,263. The exports of

fresh beef from Canada in 1927 totalled 56,742,000 lbs., of which 51,473,000 lbs. went to the United States and 581,000 lbs. to Great Britain. The total number of cattle in Canada in 1927 was 9,172,000.

Exports of beef from Australia fluctuate considerably from year to year. From available data exports during the fiscal year 1925-26 were approximately equal to those for the calendar year 1913; 1926-27 exports showed a sharp decline compared with the previous years, decreasing by 47.6 per cent. The number of cattle in 1927 (11,880,000) showed an increase over that in the pre-war period 1909-13 of approximately 3 per cent. Since the war Australian exports have been more widely distributed than previously, seeking other outlets than the British market.

The number of cattle in New Zealand has increased over 60 per cent. since the pre-war years 1909-13. This augmentation of population has come about largely through additions to dairy herds. The exports of frozen and chilled beef have increased even more than the increase in cattle population.

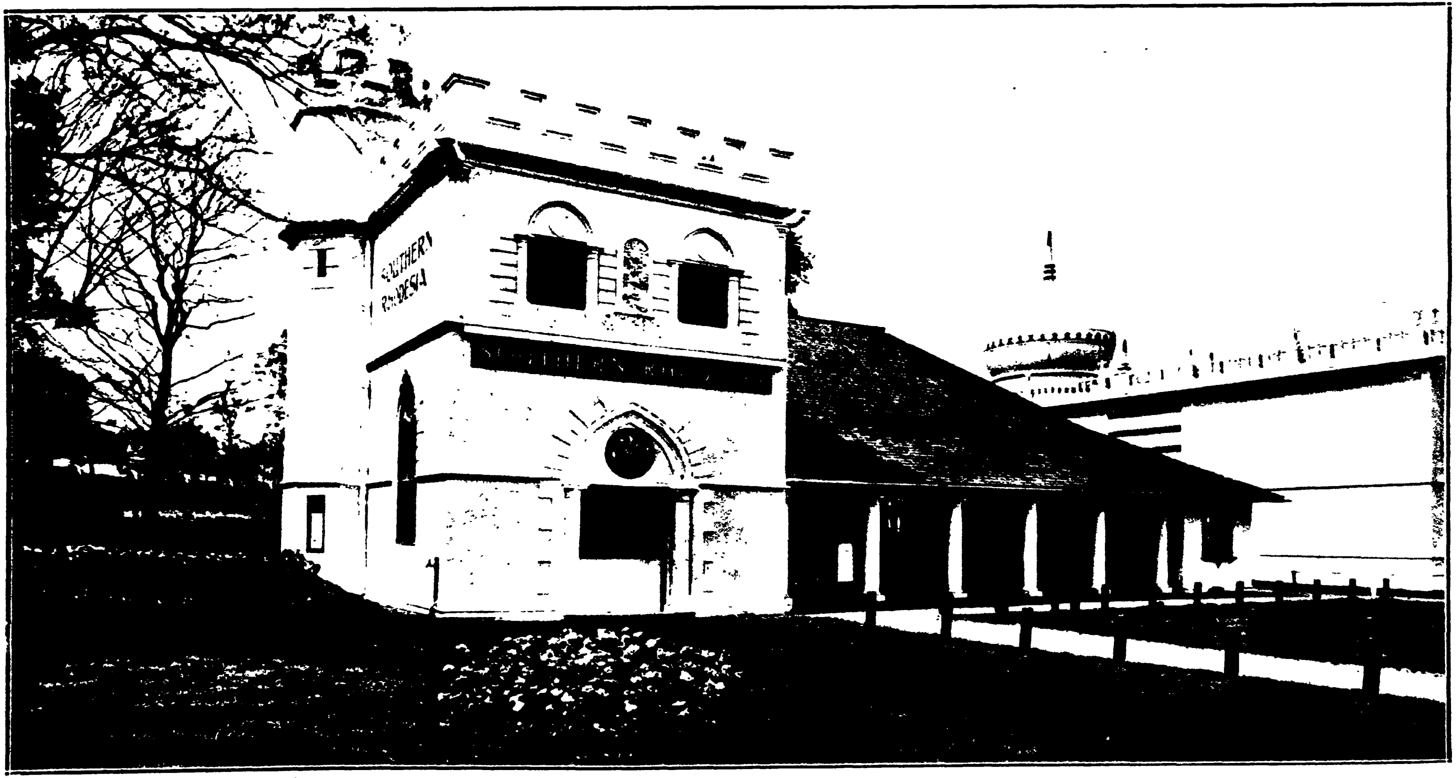
It is of interest to record that the *per capita* consumption of beef and veal in various countries in 1927 was as follows: United States, 65.4 lbs.; Canada, 68.8 lbs.; Argentine, 260.7 lbs.; United Kingdom, 64 lbs.; France, 45.9 lbs.; Germany, 40.2 lbs.; Australia (New South Wales, 1925), 125.3 lbs.; New Zealand (average of 10 years), 147.1 lbs.

# The Development of the Tobacco Industry in Southern Rhodesia.

## A HISTORICAL SURVEY.

By D. D. Brown, Chief Tobacco Expert.

*(The following is the full text of a lecture given recently by Mr. D. D. Brown before the Rhodesia Scientific Association. The valuable data which Mr. Brown has collected for his lecture represent the expenditure of a great deal of labour and time and are now placed on record for future reference. The tobacco growing industry of this Colony is at present under a cloud, due to over-production, and—although it will be no consolation to growers in their difficulties—it will be seen that exactly a similar position occurred in America in the early days of settlement. Obscure as the future of the industry is at the present moment, we are fortified by the all-important fact that Southern Rhodesia is one of the very few countries which can grow the bright cigarette leaf that is so much in demand to-day. This being so, the industry must sooner or later come into its own. As to when that time will be depends upon our own efforts. There must be the will to win through; the will which has helped us to surmount many obstacles in the past, and in a short span of time has brought us to our present stage of development. The sinking of differences, the combining of interests and the intelligent direction of united effort will enable us to fulfil our natural destiny as a world producer of tobacco.*—Ed., R.A.J.)




The Southern Rhodesia Pavilion at Wembley, 1925.

The subject under discussion is one which is greatly exercising the public mind at the present time, and one which closely concerns the stability of our whole agricultural industry.

Before introducing the subject of our local industry it may be advisable to sketch briefly some of the salient facts concerning the tobacco industry in other countries in order to gain a true perspective and obviate any likelihood of looking upon our own efforts from a purely parochial point of view.

A few years ago there was no absolute necessity to study the activities of other countries, as Rhodesian tobacco was not then in direct competition with their product on overseas markets. This, however, is no longer the case, and we are therefore bound to consider the activities of our competitors who are established on the markets we have lately entered and on others where it is hoped our leaf will be placed in future.

Tobacco itself can be regarded as being either a luxury or as a necessity in modern times, whereas previously it was considered only as a luxury.

**Early History.**—Tobacco has been used by the Orientals from time immemorial. Chinese medical men recognised the value of tobacco as an antiseptic thousands of years ago. The knowledge of the use of tobacco by the American Indians was carried to Europe in the year 1492 by Christopher Columbus and members of his expedition. In 1565 Sir John Hawkins described how, in America, tobacco was smoked in crude pipes fashioned from bowls of clay and mouthpieces of cane. The use of tobacco for chewing and in the forms of snuff, cigarettes and cigars, in addition to pipe smoking, was prevalent among the natives when America was first visited by Columbus.

Sir Walter Raleigh was not the first European advocate of American tobacco, although this is a misconception held in the minds of many. Hawkins and many others had introduced smoking into England while Raleigh was still only a young boy. The fame attached to the name of Raleigh has been due to his having access to the highest social circles in England at that period, and consequently being better able to

exert more influence than his predecessors in creating publicity for tobacco. Ever since the 15th century we find tobacco gaining importance as a commercial commodity in world trade. It has been used as a means of barter and exchange and has also paid in kind the fares of the intended wives of the early settlers who left England to settle in America. To-day it is an important source of revenue in all civilised countries throughout the world.

At the time of the discovery of the New World the aborigines were growing tobacco from Canada southward as far as Southern Brazil. Spanish settlers began commercial tobacco culture in the West Indies, Central America and South America long before Jamestown was established. The colonists of Virginia and Maryland were, therefore, forced to meet the competition of the Spanish product on the markets of Europe. Nevertheless, tobacco promptly became a leading article of exchange with the motherland, and its culture still remains a feature of the agricultural activities in these two States.

The first colonists who settled in America purchased their tobacco from the Indians. It was then but little more than a very strongly flavoured weed. The cultivation of the plant by settlers commenced when the number of white settlements increased; this would have been about the year 1612. John Rolfe, an early settler in Virginia, was mainly responsible for effecting improvement in the quality of the tobacco plant and making its smoking qualities comparable with the West Indies product. Tobacco growers of modern times are still carrying on the work of improvement initiated by Rolfe, though the standard by which such work is regulated is no longer by comparison with West Indies leaf, but with American leaf, which has been evolved through countless generations of the progeny of plants raised by Rolfe and his followers.

It is recorded that by 1615 the Virginian tobacco was equal in quality to leaf imported from the island of Trinidad. The following year the Governor of Virginia, realising that the demand for tobacco in England was rapidly increasing, used his efforts to induce the settlers to increase the production of tobacco. This policy was pursued by the Governors who followed him in office. In the year 1618 prime grades

of Virginian tobacco realised 3s. per lb. The settlement Henrico, afterwards re-named Richmond, was founded in 1619 as a result of the stimulation of the high prices of tobacco upon tobacco culture. The results secured in the vicinity of Henrico gave rise to many settlements in that area.

**Over-Production.**—Throughout the early years of colonisation there was a tendency for production to increase more rapidly than the demand of the European market, thus causing very low prices. Tobacco was a constant object of legislation in vain efforts to remedy this situation by such devices as fixing prices, curtailing production and providing penalties for false packing. The progress of the industry was subjected to many setbacks before attaining to the eminent place it now holds in the world's tobacco trade. In 1618 20,000 lbs. were exported; in 1619 40,000 lbs., and in 1620 55,000 lbs., the average price per lb. being about 2s. 3d. After that exports shot upward, and prices did the reverse. In 1639, a million and a half lbs. were exported at an average price of 3d. per lb., and in 1664 nearly 24 million lbs. at 1½d. per lb. During the next century and a half exports climbed unsteadily, exceeding a hundred million lbs. for the first time in 1770 and repeating it in 1772 and 1774. Then the tobacco producers received a severe blow. From 102 million lbs. in 1774, exports fell the next year to 15 millions, and in the historic year of 1776 less than 2½ millions were sent abroad. Exports remained low during the Revolution, but they rebounded quickly once normal conditions were again restored. In 1782 less than 20 millions were exported, but in 1786 the amount reached 90 millions and 118 millions in 1789. The latter was the high water mark for nearly 50 years, during which time the industry appears to have suffered several periods of depression.

**Slump and Recovery.**—From 112 millions in 1791, the exports fell suddenly to 60 millions the next year, and after zig-zagging up and down for 15 years, the second war with Great Britain brought the figure down to five million lbs. in 1812 and three million lbs. in 1813. From there it bounced up to 85 millions in 1814, but it was not until 1851 that exports of American tobacco were safely and permanently over the 100 million mark. By 1870 they were permanently

over the 200 million mark, and since 1899 they have only twice fallen below the 300 million level, and twice have they exceeded 600 millions. Export values have increased from £2,000 in 1618 to about £28,000,000 in 1927. The record for flue-cured tobacco exports was reached in 1928, when 435 million lbs. were shipped.

The history of the American tobacco industry fairly represents the ups and downs in the history of other tobacco-growing countries; fluctuations in production and exports, caused by wars and economic conditions, have been an experience common to all.

In the distant future the records of the history of our own industry will, no doubt, show a degree of similarity to the histories of those countries in which European settlers first commercialised an erstwhile weed.

**In Southern Rhodesia.**—Tobacco culture on a commercial scale has been carried on in Southern Rhodesia since about the year 1910, the crops produced prior to that year being of no great significance commercially. Farmers in the Union of South Africa were producing crops before the European settlement of Rhodesia, and some of the early settlers arriving in this Colony carried up with them a few tobacco seeds, which in time were planted in garden patches. The small number of plants raised sufficed to meet the requirements of the owner and perhaps a few friends. The natives of the country, before the arrival of the white man, cultivated their own tobacco, which, like to-day, was allowed to grow as a weed around their kraal in small and irregular patches, sufficient in extent to supply local consumption by the native inhabitants. When tobacco was first planted on a commercial scale, the necessary tobacco seed was imported from the United States; some seed, also of American origin, was imported from the Union of South Africa, and the writer can recall despatching a small quantity of such seed to Rhodesia in 1911. The first record of a tobacco crop being grown by a European farmer was in the Umtali district during the year 1894.

**Birthplace of the Industry.**—The Marandellas district was the centre of production in the early years and can claim to be the birthplace of the tobacco industry in the same way

that Virginia can be regarded in relation to the industry in the United States of America. During the comparatively short period of its existence the tobacco industry in this Colony does not present one unbroken line of success. There are many of the early growers in this Colony to-day who will recall the disappointment of past years and the fluctuation in production and the prices received. The first authentic returns of tobacco produced in Southern Rhodesia are for the year 1914, when the yield was stated to be a little over three million lbs.; in 1915 the output dropped to 426,000 lbs.; in 1916 it was 637,000 lbs.; 910,000 lbs. in 1917, and 1½ million lbs. in 1918. There was another drop in 1919 from 1½ million lbs. to 620,000 lbs.; in 1920 the yield was 2,000,900 lbs., and from the latter figure the yields for the successive years, including 1925, were 3,746,000 lbs., 3,182,000 lbs., 2,810,000 lbs., 3,878,000 lbs. and 2,405,000 lbs. respectively. A phenomenal increase in production has taken place since 1925, the yields being 5,659,000 lbs. in 1926, 19,264,000 lbs. in 1927, and 24,889,000 lbs. in 1928. It will thus be seen that during the period 1926 to 1928 the annual increments were 130 per cent., 240 per cent. and 28 per cent. respectively, or a total increase of 933 per cent. over the yield for 1925.

The trend of production is shown in the following table:

## TABLE No. 1.

### Production and Exports of Virginia and Turkish Types of Tobacco, Southern Rhodesia, 1910-1928.

| Year. | Production, S. Rhodesia. | | | Exports to Union of South Africa. | | Exports to United Kingdom. | Other exports. | Total exports. | Carry over each year (plus or minus. |
|---|---|---|---|---|---|---|---|---|---|
| | Virginia Type, lbs. | Turkish type, lbs. | Total production, lbs. | Turkish type, lbs. | Virginia type, lbs. | Virginia type, lbs. | Virginia type, lbs. | Virginia type, lbs. | Virginia type, lbs. |
| 1910 | | | | | 255,842 | 66,492 | | | |
| 1911 | | | | | 375,440 | 2,303 | | | |
| 1912 | | | | | 583,965 | 34,503 | | | |
| 1913 | | | | | 1,070,255 | 27,588 | | | |
| 1914 | | | 3,061,750 | | 1,037,967 | 1,198,622 | 991 | | |
| 1915 | | | 426,423 | | 1,534,823 | | 60 | | |
| 1916 | | | 637,261 | | 1,308,790 | 2,621 | | | |
| 1917 | | | 910,684 | | 454,565 | 250,347 | 682 | | |
| 1918 | 415,210 | 204,961 | 620,171 | 204,961 | 551,405 | 135,997 | 4,338 | 691,740 | − 276,530 |
| 1919 | 1,179,932 | 287,680 | 1,467,612 | 287,680 | 445,265 | 96,050 | 738 | 542,053 | + 637,879 |
| 1920 | 2,435,994 | 511,633 | 2,947,627 | 511,633 | 1,192,283 | 33,339 | | 1,225,622 | +1,210,372 |
| 1921 | 3,192,662 | 554,320 | 3,746,320 | 554,320 | 1,824,283 | | 5,137 | 1,829,420 | +1,363,242 |
| 1922 | 2,880,104 | 302,225 | 3,182,359 | 302,225 | 1,794,719 | 144,769 | 6,176 | 1,945,664 | + 934,440 |
| 1923 | 2,540,942 | 269,839 | 2,810,781 | 269,839 | 3,658,485 | 1,174 | 1,564 | 3,661,223 | −1,120,281 |
| 1924 | 3,426,390 | 452,070 | 3,878,460 | 452,070 | 4,142,232 | 314,803 | 88,646 | 4,545,681 | −1,119,291 |
| 1925 | 1,987,382 | 418,522 | 2,405,904 | 418,522 | 1,596,985 | 360,502 | 215,845 | 2,173,332 | − 185,950 |
| 1926 | 5,313,186 | 346,623 | 5,659,809 | 346,623 | 2,282,645 | 1,417,349 | 391,972 | 4,691,966 | + 621,220 |
| 1927 | 18,631,069 | 633,488 | 19,264,557 | 633,488 | 6,775,615 | 8,160,761 | 372,519 | 15,308,895 | +3,322,174 |
| 1928 | 24,437,664 | 451,580 | 24,889,244 | 451,580 | 4,836,138 | 9,504,356 | 438,531 | 14,779,024 | +9,658,639 |

**Supply and Demand.**—Production in certain years did not equal demand, as for instance in the year 1918, when the exports for the year were 276,530 lbs. in excess of production; this deficiency would be met by a surplus built up during previous years. The total production of tobacco in this Colony has been subject to a deal of fluctuation, a largely decreased output being experienced during the period of the Great War. From the year 1920 until 1926 production has been reasonably steady, when the influence of climatic conditions on the yield is considered. The influence of the rapid extension during the subsequent period, however, is reflected in the quantity of tobacco held in bond in Great Britain, and clearly indicates the necessity for curtailment in production until the demand for Southern Rhodesian tobacco increases. Especially does this apply to our market in the United Kingdom, where present stocks in bond are stated to be equivalent to four years' supply. When production exceeds manufacturing requirements prices decline and the surplus tobacco accumulates in the form of stock on hand. These heavy stocks tend to depress prices in succeeding years. In order to secure favourable market conditions producers should neither starve the market nor glut it, but try to preserve the normal relationship between production and consumption. It is quite evident from past experience that farmers complying with the law of supply and demand have benefited thereby, whilst those who neglected the observance of this rule have done so to their disadvantage.

**An Export Trade.**—Our exports to both the Union of South Africa and Great Britain are also indicated in the above table. It is recorded that 66,492 lbs. of tobacco were exported to the United Kingdom in 1910, 2,303 lbs. in 1911, 34,503 lbs. in 1912, 27,588 lbs. in 1913 and 1,198,000 lbs. in 1914. During 1915 no tobacco was shipped, and in 1921 also the exports were nil. In 1916 2,621 lbs. were exported and 250,000 lbs. the year following. After some fluctuation the exports eventually reached a total of one and a half million lbs. in 1926; the only other export to exceed the million lbs. mark was made 12 years previously. In 1927 the exports jumped up to 8,160,000 lbs., and again in 1928 to 9½ millions.

**Rhodesian Tobacco in England.**—An endeavour made in the year 1914 to establish an export trade with the United Kingdom proved unsuccessful. This abortive attempt, coupled with the advent of the Great War, prevented any further serious attempt being made to enter this market. The Empire Exhibition at Wembley during the year 1924 was responsible for a revival in the export of tobacco to Great Britain, and its influence was felt later in an influx of new settlers to the Colony, attracted largely by the possibilities of the tobacco growing industry. The leaf on exhibition at Wembley caused a favourable impression amongst those interested in the tobacco trade, shipments on a commercial scale were encouraged and attractive prices were quoted for tobacco similar to that represented on the Exhibition.

Another factor influencing the increase in the exports to the United Kingdom was the preference granted by the Imperial Government; this was first granted in September, 1919, when a rebate of 1s. 4 5-12d. was allowed. In July, 1925, the rebate was increased from one-sixth to one-quarter of the full rate of import duty or 2s. 0 5-8d. per lb. The latter concession has been ratified for ten years dating from 1st July, 1926.

There is still much controversy in this Colony regarding the allocation of the preference and the benefits gained thereby. In the first instance this preference was granted in order to enable Empire producers to gain some share in the huge tobacco trade of the United Kingdom and to stimulate inter-Empire trade. Theoretically the preference should benefit the growers through increasing the demand for their product, the manufacturers through an increased turnover, and the consumers would have the advantage in the form of cheaper smokes. Although in some instances the preference may not be strictly allocated as originally intended, there is ample evidence that the demand for Empire tobacco has grown since the rebate was first granted on colonial tobacco imported into Great Britain. It is, however, an erroneous impression to hold that Imperial preference will stabilise the price or maintain it at a high level; this is a matter entirely dependent upon supply and demand.

**Exports to the Union.**—Our exports to the Union of South Africa show a general tendency to increase approxi-


Southern Rhodesia represented at the Birmingham and Midland Grocers

mately to 7 million lbs. This latter figure, according to Union statistical returns, is somewhat in excess of their requirements of Southern Rhodesian leaf for local consumption, and it may therefore be assumed that manufacturers are building up stocks of Rhodesian tobacco. The exports of Virginia tobacco to the Union during the period 1910 to 1917 were not separately recorded, but the figures stated are for the combined exports of Turkish and Virginia types. From the year 1918 separate records are available concerning each type.

In the foregoing Table No. 1, the exports indicated for 1918 and following years are for the Virginia type only, but for the period prior to that year the exports to the Union include a small percentage of the Turkish type. All exports to the United Kingdom and other countries are solely Virginia type. The industry in this Colony has been built up on the existing demand of the South African market. The Union market has been a valuable one in the past and it is hoped that this will continue in the future, although the same scope for expansion as is presented by the United Kingdom is not apparent. There is, however, always the possibility of the importation of Rhodesian leaf being considered detrimental to the interests of tobacco growers in the south, and an embargo on our tobacco under these circumstances would most probably be the mode of protection advocated by the Union producers.

Our present safeguard lies in the fact that flue curing is practised only on an extremely limited scale in the Union; consequently our exports of this type of tobacco remain secure until such time as a suitable substitute is produced on a commercial scale within the Union of South Africa.

**Competition in the South.**—There are areas in the Transvaal and Orange Free State where the flue-cured type of leaf could be produced. Experimental work has been carried on in the Transvaal since before 1910. The principal reasons why the production of flue-cured tobacco has not assumed any degree of importance are the lack of fuel in certain areas, the initial cost of curing barns and plant, the disinclination of farmers to produce this type and also to the extent of the local market for the present type of tobacco produced in the various districts of the Union. The old conservative spirit

is gradually being eliminated by education and the introduction of modern ideas. No forecasts can be made regarding the influence of these factors on the future production, but it is certain that the coming generation of farmers will be better able to realise and take advantage of any opportunities that offer to enhance their prospects, and the results may be quite capable of reflecting on our tobacco exports to the Union. No great export trade for unmanufactured tobacco has yet been developed by the Union of South Africa.

The industry has, until a few years ago, been built up on the demand for local manufacture, but in common with the rest of the tobacco producing countries, the Union now has a surplus production and stocks of unsold leaf are excessive.

Overseas markets are being explored with a view to finding an outlet for these surplus stocks.

**Trade with the Union.**—Southern Rhodesia is a valuable market for the manufactured tobacco. The balance of trade between this Colony and the Union is shown in the following tables, one of which gives the value of tobacco exports and imports between the Union and Southern Rhodesia, the other denotes the re-imports of Rhodesian tobacco after being manufactured in South Africa.

## TABLE No. 2.

Value of Exports and Imports of Tobacco: Southern Rhodesia and Union of South Africa.

| Year. | Exports of unmanufactured tobacco from Southern Rhodesia. | | Imports of manufactured tobacco from the Union of South Africa into Southern Rhodesia. | | Value paid for manufactured tobacco in excess of value received for our unmanufactured leaf. |
|---|---|---|---|---|---|
| | lbs. | £ | lbs. | £ | £ |
| 1910 | 255,842 | 20,242 | 356,823 | 44,768 | + 24,526 |
| 1911 | 375,440 | 29,597 | 352,536 | 57,710 | + 28,113 |
| 1912 | 583,965 | 28,728 | 338,605 | 56,700 | + 28,028 |
| 1913 | 1,070,255 | 49,995 | 495,550 | 63,273 | + 13,278 |
| 1914 | 1,037,967 | 49,542 | 381,623 | 60,129 | + 10,587 |
| 1915 | 1,534,823 | 37,010 | 366,890 | 68,601 | + 31,591 |
| 1916 | 1,308,790 | 36,038 | 292,149 | 61,460 | + 25,438 |
| 1917 | 454,565 | 27,765 | 455,398 | 72,730 | + 44,965 |
| 1918 | 756,366 | 47,909 | 355,347 | 66,687 | + 18,778 |
| 1919 | 752,945 | 60,218 | 297,025 | 82,319 | + 22,101 |
| 1920 | 1,703,916 | 138 693 | 320,472 | 114,120 | − 24,573 |
| 1921 | 2,378,603 | 188,469 | 326,213 | 119,697 | − 68,772 |
| 1922 | 2,096,974 | 130,701 | 313,305 | 105,967 | − 24,734 |
| 1923 | 3,928,324 | 185,899 | 336,074 | 113,740 | − 72,159 |
| 1924 | 4,594,302 | 248,288 | 298,905 | 110,035 | −138,253 |
| 1925 | 2,015,507 | 113,206 | 276,592 | 100,944 | − 12,262 |
| 1926 | 2,629,268 | 166,768 | 382,480 | 152,481 | − 14,287 |
| 1927 | 7,439,103 | 577,597 | 454,299 | 181,394 | −396,203 |
| *1928 | 4,885,062 | 225,694 | 398,497 | 165,013 | − 60,681 |

*1928 = 1928 returns for 11 months—1st January to 30th November.

During the period 1910-19 inclusive a sum of £247,405 in excess of the value received for our exports was paid for the imports from the Union. In the period 1920-28 inclusive the value of our exports was £811,924 in excess of the value of the imports, leaving a balance of £564,519 in favour of exports from Southern Rhodesia. This balance in our favour has been built up since 1924.

## TABLE No. 3.

| Year. | Total exports of unmanufactured tobacco. | | Re-imports of Rhodesian tobacco from Union of South Africa. | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Quantity. | | | Value. | | |
| | | | Cigarettes. | Cut tobacco. | Total. | Cigarettes. | Cut tobacco. | Total. |
| | lbs. | £ | lbs. | lbs. | lbs. | £ | £ | £ |
| 1910 | 255,842 | 20,242 | 69,618 | 134,901 | 204,519 | 24,013 | 6,751 | 30,764 |
| 1911 | 375,440 | 29,597 | 82,310 | 125,124 | 207,434 | 30,600 | 9,730 | 40,330 |
| 1912 | 583,965 | 28,728 | 82,930 | 117,471 | 200,401 | 31,856 | 8,440 | 40,296 |
| 1913 | 1,070,255 | 49,995 | 82,343 | 196,311 | 278,653 | 32,413 | 11,378 | 43,791 |
| 1914 | 1,037,967 | 49,542 | 89,307 | 130,495 | 219,802 | 35,297 | 8,004 | 43,301 |
| 1915 | 1,534,823 | 37,010 | 94,127 | 123,990 | 218,117 | 41,979 | 8,064 | 50,043 |
| 1916 | 1,308,790 | 36,038 | 88,258 | 90,913 | 179,171 | 39,034 | 6,333 | 45,367 |
| 1917 | 454,565 | 27,765 | 101,457 | 164,289 | 265,746 | 43,641 | 9,090 | 52,731 |
| 1918 | 756,366 | 47,909 | 96,450 | 117,392 | 213,842 | 42,215 | 6,459 | 48,774 |
| 1919 | 752,945 | 60,218 | 125,734 | 69.929 | 195,663 | 56,965 | 5,556 | 62,521 |
| 1920 | 1,703,916 | 138,693 | 145,680 | 69,186 | 214,866 | 80,336 | 6,850 | 87,186 |
| 1921 | 2,378,603 | 188,469 | 136,528 | 77,776 | 214,304 | 77,658 | 11,313 | 88,971 |
| 1922 | 2,096,974 | 130,701 | 126,087 | 77,849 | 203,936 | 68,662 | 10,070 | 78,732 |
| 1923 | 3,928,324 | 185,899 | 138,146 | 86,696 | 224,842 | 74,997 | 9,997 | 84,996 |
| 1924 | 4,594,302 | 248,288 | 149,951 | 60,233 | 210,184 | 59,337 | 7,932 | 67,269 |
| 1925 | 2,015,507 | 113,206 | 132,871 | 55,252 | 188,123 | 69,341 | 7,134 | 76,475 |
| 1926 | 2,629,268 | 166,768 | 198,574 | 67,374 | 265,948 | 106,546 | 9,649 | 116,195 |
| 1927 | 7,439,103 | 577,597 | 238,249 | 78,244 | 316,493 | 127,362 | 11,096 | 138,458 |
| *1928 | 4,885,062 | 225,694 | 223,924 | 59,296 | 283,220 | 118,340 | 8,544 | 126,884 |

* 1928 returns for 11 months from 1st January to 30th Novembe

The above figures relating to re-imports of Rhodesian tobacco were arrived at by working on the assumption that 80 per cent. of cigarette imports from the Union consist of Rhodesian tobacco, while 50 per cent. of the imports of cut tobacco are assumed to be of Rhodesian origin.

Taken on a financial basis, it will be noted that the values of exports with imports balanced in the year 1924. Prior to the year 1920, more money was being paid for manufactured tobacco than was received by the growers, and from 1920 to 1928 the value of the exports of raw leaf has been greater than the sums spent in the purchase of the manufactured goods. It is evident, therefore, that the trade between both countries is of mutual benefit, as the Union provides a market for our unmanufactured tobacco and Southern Rhodesia is a useful market for the product manufactured in the Union. A noteworthy feature relating to the foregoing trade is the quantity of Rhodesian tobacco which is re-imported in manufactured form to the country of origin.

The figures relative to re-imports of Rhodesian tobacco were arrived at by working on the assumption that 80 per cent. of cigarette imports consist of Rhodesian leaf, while 50 per cent. of the imports of cut tobacco are assumed to be of Rhodesian origin. These re-imports amounted to 204,500 lbs. in 1910, and after a certain amount of annual fluctuation have now reached a total in excess of 316,000 lbs. In 1910 Rhodesians spent £31,000 and in 1926 they expended nearly £139,000 for smokes containing their own tobacco. The latter represents a substantial expenditure when the comparatively small European population is considered.

**Northern Rhodesia.**—Another factor concerning the Union market is the competition engendered by exports from Northern Rhodesia. These exports have increased from 42,000 lbs. in 1924 to over 1,000,000 lbs. in 1927.

Northern Rhodesian leaf can be used as a substitute for our product, and is therefore quite capable of assuming more serious proportions in competition with tobacco exported from Southern Rhodesia to the Union of South Africa. In the north there is an abundance of suitable soil, climatic conditions are akin to ours and an adequate supply of native labour is available. Production of flue-cured tobacco is still in its infancy, and when further development takes place the existing competition between the two Rhodesias will be augmented accordingly. Comparative exports from Southern Rhodesia and Northern Rhodesia to a common market are to be seen in Table No. 4.

# TABLE No. 4.

## Exports of Unmanufactured Tobacco (Virginia Type) from Southern Rhodesia and Northern Rhodesia.

| Year. | Southern Rhodesia. | | | | | | Northern Rhodesia. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | To United Kingdom. | To Union of South Africa. | To Northern Rhodesia. | To Belgian Congo. | To Holland. | To other countries. | To United Kingdom. | To Union of South Africa. | To Southern Rhodesia. | To Belgian Congo. | To Holland. | To other countries. |
| | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. | lbs. |
| 1910 | 66,492 | 255,842 | | | | | 20,204 | 710 | 3,224 | | | |
| 1911 | 2,303 | 375,440 | | | | | 2,494 | | 6,374 | | | |
| 1912 | 34,503 | 583,965 | | | | | | | 15,223 | | | |
| 1913 | 27,588 | 1,070,255 | | | | | | | 24,583 | | | |
| 1914 | 1,198,622 | 1,037,967 | 108 | 300 | | 583 | 8,949 | 42,413 | 18,306 | | | |
| 1915 | | 1,534,823 | | 60 | | | 10,221 | 85,469 | | | | |
| 1916 | 2,621 | 1,308,790 | | | | | | 197,933 | | | | |
| 1917 | 250,347 | 454,565 | 578 | | | 104 | | 265,307 | | | | |
| 1918 | 135,997 | 551,405 | 511 | 245 | | 3,582 | 55,343 | 389,807 | 3,546 | | | |
| 1919 | 96,050 | 445,265 | 93 | | | 520 | 223,412 | 449,292 | 2,078 | | | |
| 1920 | 33,339 | 1,192,283 | 218 | | | | 268,040 | 625,132 | 22,478 | | | |
| 1921 | | 1,824,283 | | 4,031 | | 650 | 360,515 | 740,012 | 35,294 | | | |
| 1922 | 144,769 | 1,794,719 | 456 | | | 6,176 | 81,773 | 713,221 | 36,798 | 540 | | 654 |
| 1923 | 1,174 | 3,658,485 | | | | 1,564 | 307,627 | 647.939 | 18,138 | | | 98 |
| 1924 | 314,803 | 4,142,232 | | 5,276 | 66,049 | 17,321 | 530,640 | 886,893 | 23,311 | 100 | 12,535 | 5,740 |
| 1925 | 360,502 | 1,596,985 | | 19,241 | | 40,257 | 614,362 | 820,295 | 8,098 | 1,665 | | |
| 1926 | 1,417,349 | 2,282,645 | 5,313 | 2,862 | | 233,041 | 1,108,160 | 936,264 | 6,198 | 1,759 | | 301 |
| 1927 | 8,160,761 | 6,775,615 | 2,815 | 26,685 | | 127,338 | 2,092,810 | 1,189,593 | 19,622 | | | |
| 1928 | 9,504,356 | 4,836,138 | 917 | 18,262 | 20,856 | 164.653 | | | 18,560 | | | |
| Total | 21,751,576 | 39,732,802 | 11,009 | 769,622 | 86,905 | 595,789 | 5,684,530 | 7,990,280 | 261,831 | 4,064 | 12,535 | 6,813 |

Exports from Northern Rhodesia during 1928 are not fully complete, as the only returns at present available are those relating to Southern Rhodesia.

**Nyasaland.**—In another closely adjacent territory, namely, Nyasaland, we have another competitor, principally with regard to the fire-cured tobacco market in Great Britain. As the production of this type of tobacco has not reached any considerable dimensions in Southern Rhodesia, competition is not of any serious consequence at the present time. This will come about in the future, and the intensity of competition will be governed by the comparative production of both countries. It is considered that at present there are opportunities offering on the British market for both Nyasaland and Southern Rhodesian fire-cured leaf, provided the latter does not over-produce. This provision, however, should not preclude Rhodesian fire-cured from gaining a firmer foothold each year by shipments of good quality leaf in gradually increasing quantities. Should this be the policy followed by our exporters, they will be better able to cope with existing and future competition. Nyasaland is in a more favourable position as regards the marketing of tobacco in the United Kingdom, because she has built up an industry by exports to the latter market exclusively, and as a consequence now benefits by a well established and definite demand for Nyasaland tobacco. The production of tobacco in Nyasaland is shown in Table No. 5 and may be compared with Southern Rhodesia's production.

## TABLE No. 5.

### Production of Nyasaland Tobacco.

| Year. | European. | | Native. | | Total value in European and Native. | Value of tobacco to total exports. |
|---|---|---|---|---|---|---|
| | Acreage. | Yield. | Acreage. | Yield. | | |
| | | lbs. | | lbs. | £ | Per cent. |
| 1910 | 3,274 | 1,704,637 | | | 42,626 | |
| 1911 | 4,507 | 1,949,360 | | | 53,690 | |
| 1912 | 7,411 | 2,262,545 | | | 56,598 | |
| 1913 | 10,499 | 3,763,014 | | | 94,167 | |
| 1914 | 9,642 | 3,371,200 | 492 | 37,748 | 82,735 | |
| 1915 | 7,484 | 2,596,918 | 1,558 | 1,109,255 | 92,656 | |
| 1916 | 9,386 | 3,803,547 | 1,200 | 500,577 | 112,321 | |
| 1917 | 9,516 | 4,452,403 | 1,000 | 324,173 | 159,219 | |
| 1918 | 6,027 | 2,594,368 | 8,330 | 3,211,028 | 279,511 | 57 |
| 1919 | 9,817 | 4,017,392 | 1,485 | 322,989 | 271,396 | 70 |
| 1920 | 14,218 | 4,706,158 | 1,748 | 534,888 | 481,519 | 79 |
| 1921 | 21,074 | 6,975,494 | 1,400 | 428,400 | 297,091 | 79 |
| 1922 | 18,554 | 6,141,374 | 1,276 | 390,456 | 316,540 | 75 |
| 1923 | 17,308 | 3,918,656 | 2,973 | 224,000 | 257,998 | 63 |
| 1924 | 20,596 | 7,281,696 | 3,312 | 1,176,000 | 352,348 | 63 |
| 1925 | 22,415 | 5,360,992 | 11,026 | 2,636,480 | 345,872 | 64 |
| 1926 | 22,908 | 6,446,608 | 16,107 | 4,531,520 | 457,112 | 71 |
| 1927 | 25,002 | 10,488,464 | 18,601 | 7,804,160 | 780,964 | 84 |

Production figures for 1920-22 inclusive are merely estimates—no accurate figures available.

**Other Competitors.**—In such countries as Tanganyika, Kenya and Uganda we may possibly have future aspirants to our tobacco markets. No definite information regarding the leaf types these countries are capable of producing is yet available. The introduction of tobacco as a commercial crop has only recently been effected. The first shipment of tobacco from Uganda was recorded this year when 4,353 lbs. were exported, and in view of the success which has attended this first commercial experiment, it may be expected that exports in future years will show great advances. The island of Mauritius is also making serious attempts to produce flue-cured tobacco on a commercial scale.

**Popularity of the Cigarette.**—In so far as flue-cured bright tobacco is concerned, it seems that Southern Rhodesia is in a favourable position to meet competition engendered by other colonies within the British Empire, as our leaf bears the closest similarity to the American products. Concentrated effort should therefore be directed towards the furtherance of production and marketing of this type, while at the same time using every endeavour to establish other types of tobacco produced on a lesser though increasing scale. Consumption of cigarettes is, almost the entire world over, rapidly gaining in public favour. The advance of the cigarette in popular favour in Southern Rhodesia is but a reflection of a similar trend observed in other countries, and emphasises the desirability of concentration on production of tobacco suitable for cigarette manufacture. In the year 1910 the percentages of cigarettes and cut tobacco to the total imports of manufactured tobacco into Southern Rhodesia were 27.4 per cent. cigarettes and 72.6 per cent. cut tobacco. In 1928 a complete reversal is apparent, the percentages being 70.3 per cent. and 29.7 per cent. respectively. Until the year 1918 there was a decided preference in favour of pipe tobaccos; during 1919, however, the consumption of cigarettes increased by 17 per cent. and established a lead which has been maintained and increased during the intervening period. The advance of cigarettes in public favour will be noted in Table No. 6. In the United Kingdom, for example, the percentage of cigarettes to the total consumption has increased from 23.8 per cent. in 1907 to 58.5 per cent. in 1924. Similar instances could be given denoting the same trend of advance in other European countries.

## TABLE No. 6.

Percentage of Cigarettes and Cut Tobacco in lbs. imported into Southern Rhodesia.

| Year. | Cigarettes. Quantity. | Cut tobacco. Quantity. | Total. Quantity. | Cigarettes. Percentage. | Cut tobacco. Percentage. |
|---|---|---|---|---|---|
| 1910 | 105,065 | 278,196 | 383,261 | 27.4 | 72.6 |
| 1911 | 127,781 | 258,625 | 386,406 | 33.0 | 67.0 |
| 1912 | 129,953 | 242,377 | 372,330 | 34.9 | 65.1 |
| 1913 | 128,857 | 399,503 | 528,360 | 24.4 | 75 6 |
| 1914 | 134,015 | 274,779 | 408,794 | 32 8 | 67.2 |
| 1915 | 128,768 | 251,295 | 380,063 | 33.1 | 66.9 |
| 1916 | 115,267 | 183,598 | 298,865 | 38 5 | 61.5 |
| 1917 | 131,178 | 329,455 | 460,623 | 28 5 | 71.5 |
| 1918 | 134,835 | 235,447 | 370,282 | 36.4 | 63.6 |
| 1919 | 162,516 | 140,619 | 303,135 | 53 6 | 46.4 |
| 1920 | 189.166 | 138,920 | 328,086 | 57.6 | 42.4 |
| 1921 | 174,778 | 156,546 | 331,324 | 52.7 | 47.3 |
| 1922 | 160,992 | 156,213 | 317,205 | 50.7 | 49.3 |
| 1923 | 174,644 | 163,611 | 338,255 | 51 6 | 48.4 |
| 1924 | 180,969 | 120,740 | 301,709 | 59.9 | 40.1 |
| 1925 | 167,673 | 110,815 | 278,488 | 60 2 | 39.8 |
| 1926 | 250,354 | 134,748 | 385,102 | 65.0 | 35.0 |
| 1927 | 299,922 | 156.762 | 456,684 | 65.6 | 34.4 |
| 1928 | 281,981 | 118,856 | 400,837 | 70.3 | 29 7 |

The above table serves to indicate the change over in consumption of tobacco in Southern Rhodesia. Until the year 1918 there was a decided preference displayed in favour of pipe tobaccos. During 1919, however, the consumption of cigarettes increased by 17 per cent. and established a lead which has been maintained until the year 1928, when a complete reversal of the position obtaining in 1910 has been effected. This advance of the cigarette in popular favour is not confined to Southern Rhodesia or South Africa. A similar trend is in evidence throughout Europe, America and India.

**World Production.**—It may be of interest to give a brief sketch of the world tobacco production. The total world production in 1925 is estimated as 4½ billion lbs. avoirdupois,

of which approximately 1¼ billion entered international trade channels. In 1927 the total output of the twenty-one main tobacco-producing countries dropped 3.3 per cent. below the 1926 crop.

The United States of America contributed roughly 1⅓ billion lbs. to the total world production in 1926, and the contribution of the British Empire amounted to about 1 1-10 billion, of which Southern Rhodesia produced 19 million lbs. The percentage to world production was: United States 26.5 per cent. and British Empire 22.1 per cent. When compared with the production of the rest of the world, it will be realised that the quantity of tobacco grown in this Colony is relatively very small indeed. In spite of this, however, Rhodesia is faced with difficulties in marketing the crop. This is a problem which has to be elucidated before the industry can make further progress. The importance already attained by the tobacco crop in the exports of agricultural produce from Southern Rhodesia is denoted in Table No. 7. Dependent upon the tobacco industry are approximately 5,000 Europeans and 130,000 natives. The former represents nearly 11 per cent. of the total European population, and the latter roughly 14 per cent. of the total native population. The total capital invested in the purchase and maintenance of tobacco farms and warehouses is estimated to be 5½ million pounds sterling.

TABLE No. 7.

*Agricultural Exports, S. Rhodesia.*

(1) Value of Total Agricultural Exports.

| Year. | Crops. | Stock and Dairying. | Total. |
|---|---|---|---|
| | £ | £ | £ |
| 1923 ... ... ... | 1,029,000 | 1,068,000 | 2,097,000 |
| 1924 ... ... ... | 1,177,000 | 1,056,000 | 2,233,000 |
| 1925 ... ... ... | 963,000 | 1,005,000 | 1,968,000 |
| 1926 ... ... ... | 1,524,000 | 1,255,000 | 2,779,000 |
| 1927 ... ... ... | 2,174,000 | 1,551,000 | 3,725,000 |

(2) Total Value of Tobacco Exports.

| Year. | Total value. |
| --- | --- |
| | £ |
| 1923 ... ... ... ... ... ... ... | 186,102 |
| 1924 ... ... ... ... ... ... ... | 276,447 |
| 1925 ... ... ... ... ... ... ... | 148,152 |
| 1926 ... ... ... ... ... ... ... | 328,906 |
| 1927 ... ... ... ... ... ... ... | 1,253,631 |

**The Future.**—The economic importance of this industry will be considerably increased through future development, the rate of progress being dependent upon the success attending the efforts of the growers in providing an article which conforms to the standard required by the manufacturers and governed also by the expansion of present markets and the development of others. Until the surplus of Rhodesian leaf at present stocked in Great Britain has been reduced to a reasonable minimum, and until such time as the demand increases or further outlets become available, tobacco culture in this Colony will of necessity remain limited. Although our exports to the Union of South Africa may gradually increase and other markets be found for the disposal of quantities of Rhodesian leaf, it seems evident that the greatest potentialities are offered by the United Kingdom. The latter market purchased in 1928 roughly six million lbs., and a gradual advance may reasonably be expected to ensue. Once our product has gained a firm footing in the British Isles, the quantities consumed should annually advance more rapidly until the sales greatly exceed those obtaining at the present time.

The growth of the industry is not a simple expansion, but rather there is throughout a tendency towards specialisation, and progress is dependent upon the development of definite types of leaf for which there must be a definite and well recognised demand.

The marketing of Rhodesian and Empire tobacco generally in Great Britain depends either upon the displacement of a similar quantity of foreign tobacco or on an additional demand being created especially for colonial tobacco.

## TABLE No. 8.

### Percentage of Empire, Rhodesian and Foreign Tobacco Imported into the United Kingdom.

| | Unmanufactured tobacco imported into United Kingdom. | | |
|---|---|---|---|
| Year. | Total imports from British Empire. | Imported from S. Rhodesia. | Imported from Foreign Countries. |
| 1924 ... ... ... | 10.6% | 0.2% | 89.4% |
| 1925 ... ... ... | 10.0% | 0.5% | 90.0% |
| 1926 ... ... ... | 15.1% | 1.2% | 84.9% |
| 1927 ... ... ... | 18.4% | 4.5% | 81.6% |

When studying the table illustrating the percentage of imports of Empire to American tobacco into the United Kingdom and considering also the present surplus stocks of Empire leaf in the United Kingdom it would appear that the American tobacco is holding its own and that the Empire product must depend largely upon a demand being specially created for its consumption. Should this conclusion be correct, it seems fairly obvious that the degree of popularity which Rhodesian tobacco can be made to attain will be duly reflected by the advance of the industry in this Colony.

**Give us Markets.**—There are numerous friends already at work in England, but Rhodesia requires the aid of a larger number of Raleighs to advocate and give publicity to her product. Their efforts would assist in the displacement of foreign tobaccos and stimulate a special demand for Rhodesian leaf. The exploration of other potential markets is also clearly indicated, and the following table is worthy of consideration in this respect.

# TABLE No. 9.

## Potential Markets for Rhodesian Tobacco.

| Country. | Exports from United States of America. | | | | | | Total imports, 1926. | Total exports from Southern Rhodesia, 1910-28. | |
|---|---|---|---|---|---|---|---|---|---|
| | Imports for ten months. | | Type. | Total 1928 value. | Price per lb. paid in U.S.A. | Per cent. of increase or decrease of 1928 over 1927. | | Quantity. | Value. |
| | 1928 | 1927 | | | | | | | |
| | lbs. | lbs. | | Dollars | s. d. | Per cent. | lbs. | lbs. | £ |
| Germany ... | 8,500,000 | 8,300,000 | Flue | 1,595,483 | 0 9½ | 3 increase | 134,773,000 | 9,821 | 509 |
| | 8,100,000 | 8,100,000 | Fired | 1,466,189 | 0 9 | Even | | | |
| United Kingdom | 102,000,000 | 116,900,000 | Flue | 44,100,000 | 1 9½ | 14 decrease | 186,498,000 | 21,600,000 | 1,624,365 |
| | 6,100,000 | 8,800,000 | Fired | 1,500,000 | 1 0 | 40 decrease | | | |
| Canada ... | 11,800,000 | 106,000,000 | Flue | 3,200,000 | 1 1 | 10 increase | 16,100,000 | ... | ... |
| China ... | 119,000,000 | 37,900,000 | Flue | 22,000,000 | 0 9½ | 315 increase | 74,000,000 | ... | .. |
| Japan ... | 11,000,000 | 8,000,000 | Flue | 4,500,000 | 1 8 | 37 increase | 10,284,000 | ... | ... |
| Australia ... | 17,300,000 | 13,000,000 | Flue | 6,200,000 | 1 5 | 30 increase | 20,100,000 | 113 | 11 |
| Belgium ... | 2,500,000 | 1,200,000 | Flue | 317,125 | 0 6½ | 100 increase | 41,371,000 | 583 | 26 |
| | 4,500,000 | 12,500,000 | Fired | 391,905 | 0 4½ | 6 decrease | | | |
| France ... | 13,400,000 | 20,800,000 | Fired | 1,300,000 | 0 4½ | 30 decrease | 98,522,000 | ... | ... |
| Netherlands ... | 7,700,000 | 6,100,000 | Fired | 1,700,000 | 1 1 | 26 increase | 70,951,000 | 86,905 | 4,318 |
| Spain ... | 13,300,000 | 19,400,000 | Fired | 900,000 | 0 3 | 30 decrease | 52,000,000 | ... | ... |
| British West Africa | 4,400,000 | 4,100,000 | Fired | 1,000,000 | 0 11½ | 8 increase | ... | ... | ... |
| French Africa ... | 3,300,000 | 3,200,000 | Fired | 400,000 | 0 6½ | 3 increase | ... | ... | ... |
| Denmark ... | 1,900,000 | 2,400,000 | Flue | 300,000 | 0 8½ | 20 decrease | 12,665,000 | ... | ... |

The foregoing are the quantities of American flue-cured and fire-cured tobacco supplied to these markets in 10 months during 1928, and the prices quoted are the average per lb. paid in country of origin. In 1928 the quantity of American flue-cured tobacco imported into the United Kingdom amounted to 162,000,000 lbs., for which the price paid averaged 1s. 9½d. in the United States of America.

By making a special study of their individual requirements it may be possible to develop a steady and increasing demand on markets other than the Union of South Africa and Great Britain.

Markets do not become available of their own accord—they must be sought after and cultivated. Up to the present time the exports to other markets represent only 1.3 per cent. of our total production over the period 1910 to 1928. There is ample evidence to prove that during the past few years the future crop has been based on the prices obtained the preceding season. The prices obtained in 1924 and 1925 resulted in the crop following being increased out of all proportion, thus glutting the market for succeeding years. Fancy prices are not expected nor are they considered desirable. Exceptionally high price levels are inevitably followed by a corresponding reduction. The trend of the markets should be carefully studied and production arranged accordingly.

The producer is just as necessary to the manufacturer as the manufacturer is to the producer; there appears, therefore, no sound reason for either assuming undue predominance over the other. The primary producers should receive first consideration, for they represent the worker bees, without whom the hive of industry would perish.

It would require great temerity to prognosticate the development awaiting the tobacco industry if all the interests represented in this Colony could be brought to work in closer co-operation and harmony. Machine-made cigars were not long since considered to be an unrealisable dream beyond the reach of human ingenuity. To-day we not only have machine-made cigars, but have them machine-sorted according to the minutest difference in colour shades. This achievement, due to enterprise and perseverance, yielded to applied thought

and endeavour; might we not, therefore, venture to hope that similar success will attend the tobacco industry of Southern Rhodesia?

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"Tobacco," New York, U.S.A.

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# Seeds for Sale, Gwebi Farm.

| | | s. | d. |
|---|---|---|---|
| Salisbury White Maize ... ... ... ... ... ... ... ... | 100 lbs. | 21 | 0 |
| Salisbury White Maize, Tips and Butts, per bag of | 200 lbs. | 17 | 0 |
| Kherson Oats ... ... ... ... ... ... ... ... ... ... ... | 100 lbs. | 26 | 0 |
| Kinvarra Oats ... ... ... ... ... ... ... ... ... ... ... | 100 lbs. | 26 | 0 |
| Ground Nuts (Spanish Bunch in shell) ... ... | 75 lbs. | 18 | 3 |
| Linseed (Flax J.W.S.) ... ... ... ... ... ... ... ... | per lb. | 0 | 6 |
| Boer Manna ... ... ... ... ... ... ... ... ... ... ... | per lb. | 0 | 4 |
| Majorda Seed ... ... ... ... ... ... ... ... ... ... ... | per lb. | 1 | 1 |
| Sunflower Seed (Large Black) ... ... ... ... | 100 lbs. | 16 | 0 |
| Sunflower Seed (Small Black) ... ... ... ... | 100 lbs. | 16 | 0 |
| Sweet Potato Tubers (Calabash Leaf) ... ... | 150 lbs. | 11 | 0 |
| (Available August and September.) | | | |
| Sweet Potato Slips ... ... ... ... ... ... ... ... ... | per bag | 6 | 0 |
| Napier Fodder Roots ... ... ... ... ... ... ... ... | per bag | 6 | 0 |
| Seed Potatoes ("Up-to-date," limited supply), | 150 lbs. | 21 | 0 |
| Edible Canna ... ... ... ... ... ... ... | per 100 "tubers" | 9 | 0 |

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

# Mycological Notes.

## (1) SEED TREATMENT FOR MAIZE AGAINST DIPLODIA.

## (2) SEED TREATMENT FOR TOBACCO AGAINST BACTERIAL DISEASES.

### MAIZE.

The method of seed treatment recommended below involves the use of a very fine dust which adheres firmly to the coat of treated seed and, being highly poisonous to fungi, kills the Diplodia* with which the seed may be infected. In this way it is possible to raise healthy plants from seed which ordinarily would give rise to a considerable proportion of weak plants and thus increase yield by increasing the number of large cobs produced. Some figures which follow will illustrate the beneficial effect of a dust called Tillantin R, an organic mercury compound, on maize seed infected by Diplodia, but not visibly so. The seeds for the test were taken from a cob showing a few brown kernels at the tip, similar to that described in last month's Mycological Notes, and were divided into four groups of 48 each:—

(a) Obviously mouldy.

(b) Yellow or brown discoloration very marked.

(c) Slight yellow discoloration at butt of seed.

(d) Apparently uninfected.

Each group was now divided into four lots of 12 seeds each, three lots being treated with Tillantin R and one lot being left as a control. Each lot of 12 seeds was then planted in soil in a separate tin and notes made upon subsequent development. The table which follows shows the

* Diplodia is the popular name under which all seedling-blight and ear-rotting fungi are known locally.

germination and growth of groups *a*, *b*, *c* and *d*. The column headed C represents the control, whilst 1, 2 and 3 are the respective tins.

*Germination of Treated* v. *Untreated Seed.*

| | *a* | | | | *b* | | | | *c* | | | | *d* | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | C | 1 | 2 | 3 | C | 1 | 2 | 3 | C | 1 | 2 | 3 | C |
| Strong plants | .. | ... | ... | .. | ... | ... | 1 | 1 | 9 | 8 | 9 | 5 | 8 | 7 | 10 | 4 |
| Weak plants | ... | ... | .. | ... | ... | ... | ... | ... | 3 | ... | ... | 2 | .. | ... | ... | 1 |
| TOTAL ... | ... | ... | .. | ... | ... | ... | 1 | 1 | 12 | 8 | 9 | 7 | 8 | 7 | 10 | 5 |

It will be observed that group *a* failed to germinate and that one treated and one control seed were all that grew from group *b*. This merely indicates that chemical treatment will not bring dead seeds to life, and such seed should never appear in a sample to be planted. Groups *c* and *d*, however, show total increases of 37 and 66 per cent. respectively of treated over untreated. The percentage is greater still if weak plants are excluded, and from observations made extending over a period of some weeks it is obvious that the weak plants would not produce a paying cob under field conditions. Numerous other tests made in germinators with several different varieties of maize in all stages of infection by Diplodia have given very similar results, so that there is every reason to believe that the ordinary commercial seed which is available locally will be considerably benefited by treatment with Tillantin R.

**Directions for Use.**—Obtain a wooden barrel or iron drum (no other metal may be used) of sufficient capacity to hold about one-quarter more than the amount of seed it is required to treat at one time. In one end cut a hole sufficiently large to receive the seed from a bag and make a door to fit this securely so as to be dust-tight when closed. A rubber washer between the door and the barrel should ensure this condition.

Now pour in the seed, fasten the trap door and roll the barrel to and from a fixed point so that a definite number of journeys will occupy five minutes. There will now be no need to time each lot of seed during treatment. Next open the trap door and add Tillantin R at the rate of 2 lbs. of dust to 1,000 lbs. (5 bags) of seed. Close the door and roll the barrel* for a correct number of journeys (*i.e.*, five minutes) and the treatment is complete. Empty the barrel at once and proceed as before with the next lot of seed. Care should be taken when emptying the container not to inhale the fine dust which arises, as Tillantin is poisonous. In the same way excess treated maize must not be used for human or animal consumption, but may be saved and planted the following season. The dust must always be stored in a perfectly dry, well-closed tin, away from food or forage, and any vessels which have contained Tillantin must be washed with hot soda solution before being used for any other purpose. No harm will result if the substance comes in contact with wounds.

A word of warning must now be given to those who expect to obtain enormously increased yields from the use of the dust. No reduction in the number of mouldy cobs may be expected from seed treatment alone, since the source of this infection lies in old maize trash from the previous season or seasons. Old stalks, cobs and husks are the chief danger, and only by the destruction of these will a diminution of Diplodia-infected cobs be obtained. Seed treatment will, however, give an increased stand, and in that way increase the yield, which, if reflected in only one more bag per acre (which cannot be detected except by careful experiments on reduplicated plots), will handsomely repay the cost and trouble of treatment.

## TOBACCO.

It has been shown recently that silver nitrate as a disinfectant for tobacco seed is superior to either formalin or corrosive sublimate, and it is now considered desirable to recommend this modified treatment, which it is hoped

* The barrel may, of course, be fitted with an axle, mounted upon suitable supports and rotated for five minutes. The method described above is suggested as being the simplest which has been tried.

will be given to every sample of seed planted in the coming season. The necessity for seed treatment has been constantly stressed for years, but objections to the use of corrosive sublimate or formalin have been voiced by tobacco growers, who declare that these substances have a deleterious effect upon germination. It must be admitted that there have been isolated cases of delayed or reduced germination of samples which were either improperly treated or contained a large proportion of light and thin-coated seeds, but by far the largest majority of unsatisfactory germination has been brought about by faulty watering. Seed treatment has been ridden to death as an excuse for the results of slap-dash methods. The main objection to both formalin and corrosive sublimate is the danger of retarded or decreased germination resulting from insufficient washing of the seed. Now silver nitrate, as is generally known, is rapidly oxidised by light and air to the harmless silver oxide which is insoluble in water, and if traces of nitrate should remain after treatment they will soon be converted to a harmless coating of "tarnish." Where this method has been used for several seasons no undesirable effect upon germination has been observed, so that the treatment is becoming standard in tobacco-growing countries.

**Directions for Use.**—Silver nitrate should be used in exactly the same way that is advocated for corrosive sublimate. Dissolve 17½ grains of the crystals (obtainable from any chemist) in two pints of clean, cold water* in a suitable basin, and into this pour the seed, stirring it well with the solution, so that every seed becomes wetted. Allow to soak for fifteen minutes, with occasional stirring, and then strain off the liquid through a piece of cheese cloth. Wash the seed thoroughly in five or six changes of water and then spread out upon a white cloth stretched over a framework in a shady place sheltered from the wind. Rapid drying of the seed is most essential and is best obtained in the manner described, but blotting or brown paper may be used if the seed is occasionally moved by brushing the hand over the surface. When thoroughly dry, the seed should be placed

* The solution should not be made up until just before it is required, and any excess should be kept in a tightly corked black bottle in a dark cupboard. The crystals must also be kept in the dark.

in a bag or screw-top jar which has not contained untreated seed or other tobacco refuse. Great care must be exercised after disinfection to ensure the exclusion of anything which may have been in contact with tobacco; even the hands should be washed before touching treated seed if contaminated material has recently been handled. For those who use the watering can method it is a good plan to do the treatment immediately prior to sowing, when the necessity for drying and storing is obviated.

Silver nitrate will cause a brown stain upon the hands, but this can easily be removed with pumice stone or similar material, and is quite harmless.

Remember that seed treatment of tobacco is aimed at destroying the bacteria of angular spot and wildfire which are carried on the seed coat. It does not do away with the necessity for eliminating mosaic plants directly they appear, nor will it lessen the attack by white mould if adequate priming is not carried out. As previously stated elsewhere, the only panacea for all ills is good farming.

J. C. F. H.

# Tanganyika Agricultural and Industrial Exhibition.

We have been asked to draw attention to this exhibition, which is to be held in Dar-es-Salaam from 2nd September to 6th September, 1929. An influential committee has been formed, and every endeavour is being made to make this initial exhibition a success. Agricultural products will be a prominent feature of the exhibition, and will be fully representative of the farming activities of the Colony. Sections are being arranged for cattle, sheep, pigs, coffee, maize, wheat, sisal, cotton, tobacco, tea, sugar and sugar cane, dairy products, poultry and forestry exhibits, a list which demonstrates the wide range of crops which can be grown in this fertile Colony. The address of the secretary is The Tanganyika Estate Offices, Post Box 220, Dar-es-Salaam.

# Veterinary Research in Southern Rhodesia.

## REDWATER AND GALL-SICKNESS—TRYPANOSOMIASIS—BOVINE INFECTIOUS ABORTION—EAST COAST FEVER.

(*The following extracts from the report of the Director of Veterinary Research for the year* 1928 *constitute a valuable addition to our knowledge of the diseases enumerated, and, it is hoped, bring nearer the day when they will be entirely brought under control.*—Ed., R.A.J.)

### RESEARCH WORK.

**Redwater and Gall-Sickness.**—The efforts made in the attempt to recover a virus-vaccine for the inoculation of cattle against these diseases were fully described in my annual report for the year 1927. These were continued during the early part of the present year, and "bleeders" were prepared which it is hoped may prove suitable for issue to Bulawayo and other centres in order that imported stock might be inoculated there without the expense of sending them to the Research Station, and virus-vaccine for the inoculation of young animals may be available for use in districts more than two days' distance from Salisbury. Hitherto such virus-vaccine has had to be obtained from this laboratory, and considerable delay has sometimes occurred in transporting it by road and rail, with the result that on arrival the redwater parasite, which is only viable for some 48 hours, has died out, and animals inoculated with it have not reacted. It may be pointed out that the manner in which this vaccine is intended to act is by setting up a mild form of the disease resulting in recovery, after which the animal becomes "tolerant" and resistant to re-infection

by natural means. If, however, the animal does not react it does not derive the immunity or "tolerance" resulting from recovery. The desirability, therefore, of establishing a source of virus at various important centres should be obvious. The "bleeders" prepared early in the year, however, have not been issued, pending a further test upon highly susceptible animals in order to ascertain the virulence or severity of the infection which is likely to be caused by the parasites in their blood.* It is to be regretted that the present generation of stockmen seems to have forgotten or have never heard of the grave risk which imported stock run of contracting redwater and gall-sickness when exposed to natural infection from ticks feeding upon them. Notwithstanding the improved methods of dipping and the increase in the number of tanks throughout the country, tick-infested areas are still numerous. In the days before the inoculation-process was discovered, more than 75 per centum of imported stock succumbed to these diseases, and there is reason to believe that even at the present time the mortality would be little less. As one who has had more than twenty years' experience in inoculating stock imported to this country, I am of opinion that no stockman should be encouraged to spend his money on the importation of valuable animals unless these risks are pointed out to him. There is nothing more beneficial to the stock-raising industry than the introduction of new and good blood, but there is nothing more disheartening to the enthusiast who spends his money in the laudable endeavour to improve his stock than to find that his money and his efforts have been wasted in importing an animal merely to die. It is only large and wealthy companies that can indulge in such a gamble with equanimity. The present method of inoculation, although it has been the means of enabling several hundreds of well-bred animals to survive and to improve the general quality of the cattle in the country, is by no means perfect. To produce immunity one has to give rise to the disease, and in highly susceptible animals the inoculation reaction may be very severe and even prove fatal. Also the redwater of one district varies from the redwater of another, and although the immunity con-

* *We understand that since this report was compiled tests have been carried out with the virus referred to and that the result has been satisfactory.*—Ed.

veyed by the inoculation appears to "hold good" in most districts, recent events have shown that it may break down in others. The keeping quality of the virus also is short-lived, and the inoculation of animals with a vaccine which is inert brings about no immunity, but on the other hand is apt to mislead the owner by giving him a sense of false security, as the result of which he takes unnecessary risks. It is felt, however, that during the transition period between the rendering of the country tick-free by dipping and the present state of affairs, the protective inoculation of cattle against tick-borne diseases is of such great importance to the progress of the industry that every endeavour should be made to press on with the investigations with a view to improving the present method and producing one free from its disadvantages. A new element affecting the inoculation process is the introduction of *Gonderia mutans* in cattle and ticks introduced from the south. This parasite is regarded by some as comparatively harmless, but our experience differs, for it has been found that if it invades the blood of a subject already debilitated by redwater and gall-sickness it may give the *coup de grace* to an animal which might otherwise recover. On some estates where this infection has been introduced from the Union it may be well to protect locally-bred animals against it by inoculation, and the question arises as to whether it should not be incorporated in the vaccine issued to such areas. On the other hand, it would be unwise to issue it to farms where *mutans* infection does not already exist.

**Trypanosomiasis.**—The early records of Carl Mauch (1865), Selous and other hunters and explorers indicate that in the days before the rinderpest more than half this country was infested by the tsetse fly. At the present time between ten and twenty thousand square miles are invaded by this dangerous insect, which, moreover, exhibits a tendency to return to its old haunts. The invaded area includes some of the richest agricultural and most highly mineralised parts of the country. Research, therefore, with a view to discovering some method of overcoming this pest and rendering these valuable areas suitable for occupation, would appear to be desirable. Southern Rhodesia offers exceptional opportunities for research in this direction. The fact that many

of the fly belts are easily accessible, that only one species of tsetse is known to occur, that a vigilant Veterinary Department is early aware of any outbreak of disease among stock and that the various strains of trypanosome affecting man and animals can be collected and readily removed to the laboratory for exact study facilitate scientific investigations into the many problems presented by the tsetse fly and the diseases transmitted by it. For several years large sums of money have been spent in the endeavour to eliminate the "fly" by eradicating the game upon which it is thought to be dependent, but these operations have not proved entirely successful. In the meantime, efforts have been made by my Department to deal with the problem from another angle, namely, by endeavouring to save the lives of animals belonging to settlers who have ventured into fly-infested areas. Since 1909 I have given considerable attention to the study of this subject, and as early as 1910 submitted an "Interim Report on the Animal Trypanosomiases of Southern Rhodesia." The researches recorded in that document and many other later publications have revealed the fact that the principal species of trypanosome met with in man and animals in this country are *Trypanosoma brucei* and its associate *T. rhodesiense*, which occur in equines and dogs and very rarely in man; *T. congolense*, or, as I prefer to call it, *T. pecorum*, which is the parasite most commonly met with in cattle; *T. nanum* and *T. simiæ*, closely related species affecting horses and pigs respectively, and *T. vivax*, occasionally met with in cattle. These all give rise to disease acute, sub-acute or chronic, depending upon varying circumstances such as climatic conditions, food, work, the number of infective flies and the exaltation or attenuation of the virulence of the parasite by passage. In 1909, after a visit to the Pasteur Institute, Paris, the writer introduced a method of treatment consisting of alternating doses of antimony and arsenic. Later it was found that it was the antimony which was the more important element in the treatment, and to this day that drug has not been surpassed as a remedy for trypanosomiasis in cattle. Unfortunately its use is not free from difficulties and dangers; for example, it has to be injected direct into the jugular vein, for if any of it makes its way under the skin it may give rise to painful swellings, abscesses and sloughs. To perform the operation

successfully it is generally necessary to throw the animal, a proceeding not beneficial to a weak and debilitated subject. Innumerable experiments have been carried out to find an alternative free from these disadvantages, but with partial success. Recently, during my vacation, my attention was drawn to several new antimony preparations, and I have reason to believe that at least one of them is not only cheap and effective, but harmless when injected under the skin. If this proves to be the case it will enable the treatment to be carried out more expeditiously and with less labour than hitherto. The antimony treatment as applied during the past eighteen years has saved the lives of many thousands of animals and has enabled farmers, miners and contractors to carry on their work in areas previously held ransom by the fly. At one time only very sick animals were treated, and often the disease, starvation or over-work had brought about a condition too serious to respond to treatment. More recently it has been administered to animals as soon as symptoms of infection became manifest. More recently still it has been applied to sick and healthy alike when there was reason to believe that infection was probable. On one estate during the past two years over three hundred head have been treated once a month with a view to catching the disease at its commencement in newly infected animals. Needless to say, this system has involved considerable time and labour and could only have been adopted by a well financed company with an abundance of labour—native and European—and with the assistance at first of a cattle inspector to superintend and instruct. These objections led me to seek for an improvement in the method. During these many years of experience certain facts attracted attention. For example, it was found that large doses or frequently repeated doses were not always necessary to bring about recovery, it sometimes happening that animals would revive after one or two injections. Also it was discovered that a cure in the sense of sterilising the animal from parasites was rarely if ever achieved. The daily examination of blood smears from recovered animals, extending over several months, revealed the fact that while such examinations were generally negative, occasionally an isolated parasite was encountered. So rare were these parasites that the inoculation of considerable quantities of the blood of the recovered animal into

susceptible subjects frequently failed to infect. In other words, the animal had become immune or "tolerant," an equilibrium having become established between the parasite and the resistant elements of the host. Further, it was observed that when animals which had recovered as the result of treatment were re-exposed to infection in the fly belt they remained healthy while other animals died. Innumerable examples of this could be given. In effect, treated recovered animals behaved very much as the game in "fly" areas; they continued to harbour the parasite, although unharmed by it, and proved resistant to re-infection. On the basis of these considerations it was decided to endeavour to elaborate a method of inoculation comparable to that adopted in the protection of bulls from overseas against redwater and gall-sickness. Such animals are deliberately infected with these diseases and, recovering as the result of treatment, thereafter become resistant to natural infection by ticks. The first step was to obtain a standardised virus, that is, one containing a single species of trypanosome having a definite course of development characterised by a more or less constant period of incubation, followed by a plentiful invasion of the peripheral blood stream of parasites responsive to treatment. For on the basis of the trypan blue treatment of piroplasmosis it was suspected that the antimony acting upon the trypanosome might break them up and liberate their toxins, in response to which the animal tissues would generate antitoxins which would thereafter render the trypanosome harmless. It was decided in the first place to experiment with a strain of *T. congolense*, and in order to eliminate other bovine infections likely to be associated with it, to standardise it in sheep and to use them as reservoirs of virus. It was soon found that the idea of "timing" the treatment was sound, and in the case of the virus which was eventually elaborated, neither massive nor frequently repeated doses were found necessary to set up in cattle the "tolerance" which was desired. The preliminary experiments having proved successful, it was decided to carry out tests on a larger scale, and in order that this might be done Mr. J. Fraser Mackenzie kindly placed twelve oxen at my disposal. These animals were inoculated with a selected virus which caused a pure infection with *T. pecorum*. They were treated according to plan, and although during the first few weeks

of the infection they showed characteristic symptoms of trypanosomiasis and lost condition, after the second treatment they commenced to improve, and notwithstanding the fact that they were exposed to the heavy rains which occurred during January, they rapidly recovered and left the station at the end of February in good condition, and were sent to Mr. Mackenzie's farm at Chiwe, in the Lomagundi district. Owing to my impending leave it was decided not to submit these animals to gross "fly" infection until my return, and it is to be regretted that this could not be done until September, for it is feared that the immunity or resistance may have become reduced during so long an interval. They were probably submitted to some infection, however, because from time to time tsetse have been taken on Chiwe farm, and four uninoculated animals died of trypanosomiasis there during my absence. On my return it was decided to send six of these oxen and six uninoculated controls purchased for the purpose into the "fly" area, in what may be called the Tchetchenini district. They were therefore sent to the Government Entomologist's camp at Cha-uka, where Mr. Chorley, who was busily engaged on tsetse fly work, supervised them and was able to arrange for them to be submitted to the bites of innumerable tsetse flies. When I visited his camp, Mr. Chorley informed me that he had found that a large number of tsetse dissected by him were infected with *Trypanosoma vivax*, and realising that no attempt had been made to inoculate the cattle against this parasite, it was thought best to remove them to the laboratory without delay before the disease should make it impossible for them to travel. The twelve animals therefore arrived in Salisbury on the 26th October and have since been under the closest observation. It was soon found that Mr. Chorley's forecast was correct. On the 29th October one of the inoculated animals showed *T. vivax* in its blood. Two days later two further inoculated animals and two uninoculated animals showed *T. vivax*, and two of the controls were found to be infected with *T. pecorum*. On the 8th November the first rains occurred, and on the following day two more inoculated animals and four of the controls showed *T. vivax* in blood smears. At the present time eleven out of the twelve have at one time or another shown *T. vivax* in their blood. Our experience in connection with *T. vivax* varies considerably

from that of other observers. For example, Richardson in Uganda refers to this parasite as swarming in the blood, but our experience indicates that it is only very rarely present, and then in very small numbers. Prolonged search may be necessary to discover it. Elsewhere it is said to be of very low virulence, but it appears to be possible that the strain with which we are working is very toxic. Certainly animals suffering from "mixed infection" become acutely sick, which confirms field observations that where *T. vivax* infection is met with, the course of the disease appears more rapid and severe than when animals are infected with *T. pecorum* only. The fact that the inoculated animals sent to Cha-uka became infected with *T. vivax* complicated the experiment, which was intended originally to prove whether the inoculation process protected them against *T. pecorum*. Nevertheless, the result has proved of considerable importance, in that it has given us a knowledge of *T. vivax* and has enabled us to carry out experiments with a view to incorporating this parasite in our inoculation process. In a report submitted to the Royal Society of Tropical Medicine and Hygiene concerning this method of inoculating cattle against trypanosomiasis, I stated, "It is not claimed that the above method, so sketchily described, will solve all our difficulties in connection with bovine trypanosomiasis, a subject which is bristling with complications. For example, it is by no means certain that it is applicable to types of infection other than those caused by *T. congolense* or even to all strains of *T. congolense* infection. The method in its present state is very far from perfect, but, being based upon the observations and results of many years' practical experience in the trypanosomiases of Southern Rhodesia, it is presented for what it is worth, and in the hope that it may suggest a line of research for other workers, and possibly, at the long last, lead to the opening up of the many millions of acres of valuable territory in tropical and sub-tropical Africa, now 'held up' by the tsetse fly, to profitable development and settlement." It will be seen from this that difficulties were foreseen, but it is hoped that these may be overcome. An objection has been raised to this method on the grounds that it involves the occupation of the tsetse fly areas by infected animals, and that they will supply nourishment and infection to the tsetse fly and possibly lead to an increase in their

numbers. This contention need not be taken seriously. It is probable that the fly in local areas can already obtain all the nourishment they require, not only from game, but from smaller animals, and that their numbers would not be materially increased by the introduction of cattle. On the contrary, the opening up of mines and farms, with the resultant cutting down of timber, would probably interfere with the breeding haunts of the fly, as in the case of the Hartley district, in which in 1908 and 1909 a heavy mortality occurred among cattle in the area lying between Gatooma, Golden Valley, Shagari and the railway at Hartley. A tour of investigation was carried out in 1909 by Major Thornton, of the Police, and the writer pointed to a central area of infection at a certain spot on the Surri Surri River. Shortly after, certain wood contractors took their spans right into this area, and a very heavy mortality of their cattle followed. But, as the result of the cutting down of the timber by them, and others who constructed a light railway to supply timber for the mines in the neighbourhood, the forest in this area was cleared up, and presumably the conditions necessary for the successful breeding of the fly were destroyed. Since then, notwithstanding an increasing number of cattle in the district, until recently this area has been almost entirely free from fly, except for those probably brought in from neighbouring districts. This may be taken as an example of what may be expected from the occupation and development of fly-infested areas if preceded by a detailed entomological survey and the early removal by miners and farmers of the forest in the neighbourhood of the breeding haunts of the fly. In the light of past experience it seems absurd that such an argument should have been advanced against an attempt to apply the practical lessons of the past to the opening up of the vast areas at present rendered useless by the fly. At any rate, the stake at issue is so great that further research on the lines indicated would appear to be justified.

**Bovine Infectious Abortion.**—Although this disease is no longer notifiable and stockmen appear to attach little importance to it, in the opinion of the writer it still constitutes one of the most serious menaces to the future progress of the cattle industry in this country. The experience of

Great Britain, New Zealand and other countries where it threatens to ruin the dairy industry should draw attention to the serious and insidious nature of the disease. In the United States of America it is regarded as of such grave importance that in the States of Pennsylvania, Missouri and Oregon it has been placed on the list of reportable diseases, and tentative regulations for its prevention and control have been instituted, and the testing of herds by the agglutination test has been made compulsory. In three other States this test is required before animals over six months of age are allowed entrance. The necessity for a standardised and simple method of applying this test in order that results may be uniform has been emphasised by several of the leading veterinary authorities in America, and it is interesting to record that such a method is available in this country, although little use is made of it. During the past year the method has been still further simplified, and by means of it a diagnosis can now be obtained by the stockman himself in as short a time as ten minutes. This method has also been applied by members of the medical profession to obtain a diagnosis of undulant fever in man, a disease which is closely associated with bovine infectious abortion in this country. In a recent report on "The Identification of *Brucella abortus* from Human Sources," Duncan states in the Transactions of the Royal Society of Tropical Medicine and Hygiene, "The increasing number of reports from the United States, South Africa, Palestine, Europe and elsewhere, which have appeared within recent years, describing the occurrence of undulant fever in areas in which the disease was formerly believed not to exist, may in some measure be due to the greater diligence with which the search for the disease is now being prosecuted and to greater accuracy in the diagnosis of obscure fevers; but there can be no doubt that in some areas, particularly in Palestine (Stuart, 1925) and Rhodesia (Bevan, 1925), they point clearly to a disease of very recent appearance which is tending to spread. The chief animal carrier in these new areas seems to be the milch cow, and the infecting organism a variety of *Br. abortus*. Except in northern Italy, where the cattle may be infected with *Br. melitensis*, there is nothing to suggest an extension from the endemic centres of the goat-borne disease, but rather the development of a new patho-

genic type, differing somewhat from the normal bovine variety of *Br. abortus* of northern countries (of which it may be a variant), but resembling closely the porcine variety. The apparent role of the milch cow as a disseminator of this new infection raises a question of great economic importance and renders very necessary a more complete study of the organisms recovered from man in the new areas of the disease as well as a thorough investigation of the possible animal carriers." The importance of infectious abortion to the stock industry, and the fact that cases of undulant fever in man continue to be admitted into hospitals throughout the country, prompted further researches with a view to clearing up some of the problems presented by these diseases. This work, which was entrusted to Mr. Lawrence, was carried out during the early part of the year and was the subject of a report forwarded in April last.

The foregoing experiments* indicate once again the close association in this country between infectious abortion of cattle and undulant fever of man. It has been known for some time that the organisms can be easily isolated by hæmoculture from the blood of infected human subjects, and the experiments show that it also invades the general blood-stream of small laboratory animals; but it has not yet been recovered from the blood of infected cattle. Had it been demonstrated that at any stage of the disease the causal organism made its way into the blood-stream, some of the mysterious cases of human infection might have been explained. The experiments have resulted in considerable improvement in laboratory technique in connection with this disease and may lead to an increased knowledge of these diseases which may prove of great importance. They emphasise the value of, and the necessity for, the study of disease from the comparative point of view.

**East Coast Fever.**—It is frequently urged that further research should be carried out in connection with East Coast Fever, for it is pointed out that if a means of protecting cattle against this disease by inoculation or of treating them with some drug comparable to trypan blue, which is a specific remedy for the allied disease piroplasmosis or red-

* Four experiments carried out by Mr. Lawrence, particulars of which are given in the Director's report and for reasons of space not reprinted.

water of cattle, could be discovered, much inconvenience caused by the present system of intensive dipping and money expended upon veterinary administration might be saved. Until the present Research Station was established in 1922, adequate facilities for these investigations were not available in this country, and even since then there have been reasons why such research has had to be restricted. In my last annual report a list of the many problems associated with this disease which remained to be solved was given. Briefly, these were in connection with the life-cycle of the causal parasite upon which quarantine measures were based; the accurate diagnosis of the diseases concerning which, in the light of recent knowledge, difficulties have been experienced; the question as to whether a "salted" ox may become a carrier and disseminator of infection; and whether game are susceptible and may act in the same way. Many of these problems can only be determined by propagating and perpetuating the disease, and in view of the fact that the late Minister of Agriculture and Lands and the Veterinary Department set themselves the task of eliminating East Coast Fever from this country and appear to be within reach of success, it is extremely doubtful whether it is in the interest of the country to deliberately set up an active focus of infection even for experimental purposes. Moreover, it is probable that all these questions can be better investigated in other countries where the disease still exists and where greater facilities for research obtain. In 1927, at the request of the late Honourable Minister for Agriculture, Sir Arnold Theiler was invited to suggest how investigations in connection with this disease might best be carried out, and drew up a memorandum containing certain recommendations and suggesting that experiments should be conducted on a large scale in this country. In reviewing this memorandum I pointed out the risk involved and stated that the investigations could be more satisfactorily carried out elsewhere. I drew attention to the fact that there already existed at Onderstepoort a veterinary research establishment second to none in the world, created by Sir Arnold Theiler himself, which until recently he controlled and where he organised and educated a highly efficient staff. I suggested that the problems relating to diagnosis and in connection with the life-cycle of ticks might best be carried out there. Also

that at Kabete in the Kenya Colony there existed a large veterinary laboratory, well organised and equipped, and where already the problems presented by East Coast Fever were receiving careful investigation. I pointed out that the conditions under which the disease occurs in that country offer every facility for determining whether immune cattle, recovered calves and game, acted as reservoirs of the East Coast Fever parasite. For example, in Kavirondoland the disease is enzootic and cattle cannot survive unless they become immune against East Coast Fever. The question as to whether recovered calves and "salted" cattle continue to harbour the parasite might be studied there far more effectively than in this country, where in twenty years only twelve animals alleged to have recovered from infection have been collected. Again, the study of the life-cycle of the ticks and their parasites might be still further studied in the Kenya Colony, where the climatic conditions for tick life are more favourable than in this country. I indicated, however, that certain investigations could be carried out in this country free from danger, and as far as this was possible were being dealt with. Sir Arnold Theiler later, in a memorandum to the Empire Marketing Board, again reviews the situation, and not only admits that some of my contentions were valid, but also in his summary makes suggestions similar to those put forward by me. With regard to the question as to whether immune cattle can transmit the disease, he states:—

> "This problem can only be solved with experiments carried out under natural conditions, viz., exposing immune cattle and susceptible cattle in sufficiently large numbers over several years. I have suggested in my memorandum to the Minister of Agriculture for Southern Rhodesia that about 250 head of susceptible cattle would be required; the Principal Veterinary Officer considers 120 to be sufficient. The point of importance is that a great number of immune cattle be obtained; the larger the number, the more certain the results. The number of susceptible cattle could be reduced, but the number of immune cattle should be increased; finally there ought to be about an equal number of both. The Director of Veterinary Research for Southern Rhodesia sees objections to this experiment being carried out in

Rhodesia, and certainly his objections are valid, since in order to obtain the immune cattle, the infection must be maintained somewhere and may be the cause of a further spread of the disease. But these objections are valid everywhere where the eradication of the disease by the destruction of the ticks is aimed at. Experiments, as explained, were planned by the writer when still Director of Veterinary Research for the Union of South Africa, but did not meet with the approval of the then Principal Veterinary Surgeon. Since then Dr. du Toit has assumed the duties both of administration and research, and on the occasion of our last meeting in London during the Empire Research Conference, he informed me that he had been making arrangements to carry out the original idea. The experiments will, however, be carried out on a limited scale only, and, I am afraid, if they produce negative results, the objection of an insufficient number of animals will be raised again. Accordingly, it would be advisable to undertake these experiments in several areas or countries at the same time. Kenya may prove to be the most suitable place for this purpose, provided a tick-infested farm can be found on which, for a number of years in succession, no case of East Coast Fever has occurred, and provided that such farm is so fenced that no accidental infection can occur, and provided that susceptible cattle can be brought there without tick infection *en route*. There would be sufficient susceptible and immune cattle obtainable in Kenya, and the experiment could possibly be carried out without risk to the rest of the country. It would be advisable to obtain the opinion of the Kenya experts."

Also with regard to the longevity of the ticks he says:—

"A satisfactory solution can only be brought about by introducing susceptible cattle on to infected farms that have been kept free of cattle for a period of fifteen months and longer. I have made a proposition to the Rhodesian Minister how the experiment ought to be carried out. The Director of Veterinary Research of Southern Rhodesia sees difficulties. The experiment could be carried out on any infected farm, wherever

East Coast Fever existed and where outside infection could be excluded. The experiment can be carried out with a minimum of risk, provided the exposed cattle, which under no conditions should be dipped, were daily examined by temperature recording and blood examination. Such examination would be tedious, and the result would be very slow in coming. Accordingly I would propose the same experiment as suggested in the Rhodesian memorandum, but preferably to be undertaken in Kenya, where infected areas are more easily available, provided of course that susceptible cattle could be introduced without the risk of picking up the infection whilst *en route* to the experiment. The Union of South Africa also might probably be able to offer suitable areas for this purpose, but of course the same objections may be raised here as by the Director of Veterinary Research in Rhodesia."

This matter is dealt with at some length, because it is felt that the ever-recurring question as to why experiments are not being carried out in connection with East Coast Fever in this country should be fully and finally disposed of. It is interesting, however, to note that certain observations in connection with supposed "salted" animals, referred to in my last report, have been continued. These animals have been closely confined in a tick-free paddock in the centre of a tick-free area and have been regularly dipped, and their temperatures have been taken daily since August, 1927. Whenever any deviation from normal has been noted the most careful search for *Theileria parva*, the causal parasite of East Coast Fever, has been made in blood smears and preparations from glands and spleen. These animals have been submitted to the most severe conditions calculated to break down any equilibrium which might exist between the East Coast Fever parasite and the resistant elements of the host. For example, they have suffered from starvation, exposure to extreme cold, heat and constant rains. Five of the animals have aborted and two of them have retained their fœtal membranes; various preparations of antimony have been injected into them subcutaneously and have caused enormous swellings, pain and abscesses, and one ox is probably one of the oldest animals in the Colony. At no time has any evidence been obtained of a recurrence of East

Coast Fever. In the *South African Journal of Science*, 1928, Professor du Toit, Director of Veterinary Services, Union of South Africa, publishes "Observations on Immunity in East Coast Fever," and mentions animals which have been subjected to the injection of provocatives, bleeding, peritonitis, abortion, bodily injury, splenectomy, trypanosome infection and heart-water. The results of these experiments seemed "to bring fairly strong evidence in favour of the view that the East Coast Fever immune animal is not liable to a relapse, not even under the most severe circumstances." In his summary du Toit states: "All the information so far points to the conclusion that the immunity against East Coast Fever cannot be broken down in the absence of infected ticks," and that "with the information available it seems justified to conclude that new outbreaks of East Coast Fever are invariably due to infected ticks, and that recovered animals need not be regarded as dangerous." One has to admit, however, that a negative result proves nothing, but a positive result would solve the much-vexed question as to whether a "salted" ox is a source of danger or not. It is therefore intended to continue our observations.

**Sheep Diseases.**—It is unfortunate that it has not been possible during the past year to continue the investigations in connection with the diseases of sheep. In other parts of the world sheep-breeding is one of the most profitable branches of the agricultural industry, and every effort should be made to place it on a sound basis in this country. From our limited experience it does not appear that Southern Rhodesia is particularly suitable for sheep, but it is possible that with the improvement of our pastures and with knowledge concerning the prevention and treatment of the numerous diseases to which our sheep are liable, sheep-breeding might become a profitable side-line in general farming. There seems reason to believe that in some parts of the country there is a deficiency in some element necessary for the well-being and development of sheep, and it is possible that this may lower their resistance to other diseases, as, for example, those caused by intestinal worms. It has frequently been noted that very fat and well-conditioned animals may carry innumerable worms, although apparently unharmed by them, and it has been suggested

that the worms are merely a secondary cause of the heavy mortality in flocks debilitated by a deficiency in some essential element in the grazing. There is no doubt, however, that the animals would be better if free from parasites, and when certain new drugs which were obtained during my leave arrive, it is intended to return to the experiments which have had to be abandoned, with a view to finding a cheap, practical and efficient method of treatment. Also it is intended when opportunity occurs to carry out investigations concerning the other numerous sheep diseases.

The permanent prosperity of most countries ultimately depends upon the pastoral industry, and notwithstanding its mineral wealth it is probable that this principle will be found to apply also to Southern Rhodesia. It has been said that this is pre-eminently a stock-raising country, but experience has shown that this opinion was based upon optimism rather than facts. It is possible, however, that science and energy can make it so. In the past the development of the pastoral industry has been arrested by the ravages of rinderpest, pleuro-pneumonia, East Coast Fever, redwater and other diseases, but these have all yielded to veterinary science. This report indicates that there are still many other diseases which remain to be overcome before rapid progress can be made and the industry placed upon a sound foundation. Veterinary research, therefore, which at present costs less than a penny a head on the two million cattle in the country, may be regarded as a profitable and necessary investment.

# Accelerating the Sprouting of Potatoes.

The following letter, addressed by Mr. Geo. Rattray, of Kingston Farm, Bindura, to the Chief Agriculturist, is published for general information:—

"I am writing to thank you for your letter of 2nd May, with Mr. Arnold's enclosure *re* treatment of seed potatoes with carbon bi-sulphide. Since it has been of the greatest assistance to me, especially in the saving of time, I thought probably that you would like to have the details and hear the results of the experiment.

"Some imported Scotch seed was planted on 23rd January and lifted on 13th April, and when dry was placed in a long shallow pit, lined with maize stalks and covered with grass, in the hope of getting the tubers to sprout at an early date. On 25th May, when the bi-sulphide treatment was started, not 1 per cent. had sprouted. A square 200-gallon iron tank with man-hole door was filled with potatoes, and two tablespoonfuls of carbon bi-sulphide were placed in a saucer on top of them, the opening being made air-tight with sacks and the lid. After remaining 24 hours in the tank the potatoes were returned to the pit and covered with grass, and a further lot was treated. By 10th June ten bags out of the thirty-five were found to have sprouted and were planted that day, and the balance—still unsprouted—the following day. The last planted, still unsprouted, were about one week to ten days longer in showing above the ground.

"The whole crop, large and small, was used for seed, but I found that the large potatoes did not respond to the treatment so readily as did the ordinary-sized seed; a further day's treatment would probably be needed for the larger tubers.

"Again thanking you for the very useful information."

The notice which appeared on this subject in the last issue of this Journal is reprinted for easy reference:—

The Manager of the Agricultural Experiment Station, Salisbury, has recently drawn attention to the greatly accelerated sprouting of seed potatoes which results from treating the seed with carbon bi-sulphide. The discovery was made more or less accidentally when fumigating the seed to destroy potato tuber moth. The slow rate of sprouting which often obtains during the cold months in Rhodesia frequently delays the date at which winter crops to be grown on moist lands or under irrigation can be planted, and the carbon bi-sulphide treatment seems likely to overcome this difficulty. On the Experiment Station two tablespoonfuls of the fumigant have been used in a cubic yard of seed, the potatoes being exposed to the gas for twenty-four hours. Within ten days 70 to 80 per cent. of the seed should show signs of sprouting.

Care should be taken not to use too much carbon bi-sulphide, as an excess may possibly injure the tubers, though larger size seed than the normal may possibly benefit from a slightly stronger solution. The tubers should be placed in an airtight container for preference, and the carbon bi-sulphide in a saucer or some similar receptacle, on the top of the seed. It is probable that a pit in the ground covered with a tarpaulin, the sides of which are covered with sand or earth, would prove as effective as a metal or wooden receptacle. It must always be remembered that carbon bi-sulphide gas is poisonous and highly inflammable; care must be taken, therefore, not to inhale the fumes or to bring an exposed light into its near vicinity.

One farmer who has recently tested this method of seed treatment reports it to have been entirely satisfactory. It is probable that once sprouting is commenced it should be further accelerated by placing the tubers in a slightly heated tobacco barn in which a reasonable amount of humidity is maintained.

# Frog Eye Disease of Tobacco.

By J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.,
Chief Botanist and Mycologist.

Of the many leaf spots of tobacco which were so conspicuous during the past season, probably the greatest amount of damage was caused by the disease known as Frog Eye. It was observed in seed beds, lands and barns in all districts and was undoubtedly more widespread than has previously been recorded. The abnormally heavy rainfall experienced throughout the Colony would account for the prevalence of Frog Eye, which undoubtedly thrives in warm, humid weather, whilst delayed ripening of the leaf, resulting from late rains, is another condition favouring its development.

Frog Eye is caused by a fungus (*Cercospora nicotianæ*), which ramifies through the tissues of the leaves, causing the typical leaf spot which gives the disease its name (Fig. 1). The spots are roughly circular in shape, have an ashy white or pale brown centre, surrounded as a rule by a narrow, dark brown margin. Occasionally the spots may be somewhat angular in shape and be devoid of the conspicuous white centre, and under these circumstances are difficult to distinguish from Angular Spot (*Bacterium angulatum*) lesions, but almost invariably a white area subsequently appears, which, however, may remain small. If closely examined by the aid of a lens, a faint, black, powdery covering may be observed on the white centres of many of the spots, this being a mass of the spores of the fungus, which are borne on the ends of minute branches growing out from the breathing pores (*stomata*) of the leaf. These spores may be called the "seeds" of the fungus, and give rise to new centres of infection wherever they alight upon a suitable tobacco leaf. The spores germinate under moist conditions by pushing out

a fine tube, which enters the leaf and continues to grow in the interior, feeding upon and killing the leaf cells and eventually developing into a branched network of fine tubes throughout the diseased area. As these branching tubes advance, so the area which is killed enlarges, until it becomes easily visible to the naked eye; and after growth has continued for some days, the lesion becomes recognisable as a Frog Eye spot. Soon after this, fungus filaments grow out through the surface of the leaf and produce long, tapering spores at their tips, which can initiate new infection and another life cycle of the fungus. It can thus be understood how a few centres of infection can cause the severe epidemics which have been experienced this season. Leaf-inhabiting fungi can be readily compared with weeds, and the old adage about "One year's seeding, etc.," is quite applicable to the effect of "one week's sporing" in a field of tobacco.

A form of Frog Eye disease even more serious than that appearing in the lands is the black spotting which frequently develops on apparently clean leaf in the barns when the temperature is raised to about 120° F.

The condition shown in Fig. 3 is most commonly encountered in Rhodesia and appears to be generally known as "Pole Burn" or "Pole Sweat." It is, however, caused by incipient infections of the fungus, which are overlooked when the leaf is reaped and which develop in the humid atmosphere of the early stages of curing. When the temperature is raised to about 120° F. the growth of the fungus is apparently checked, and the cells in infected areas are probably killed and turn black. This phase of the disease has recently been demonstrated in Nyasaland by Dr. Butler (1), who describes conditions identical with those generally experienced in Rhodesia. An extreme form of this barn spotting is shown in Fig. 2, where numerous small spots coalesce to form irregular black blotches covering almost the entire surface of the leaf and reducing its market value to nil. It is the experience of the writer that the first form of isolated, roughly circular, brittle black spots is characteristic of the bright grades of leaf, but that the type shown in Fig. 2 is more frequently found upon the medium grades, particularly when the leaf is of a thick, coarse texture. This may not be true in all instances, but the material received

in this laboratory and that examined on farms fall into the two categories described.

The conditions favouring the disease in the lands do not appear to differ from those which might be expected for a leaf-inhabiting fungus. Take almost any native plant, cultivated plant or weed and examine its leaves when it is approaching maturity. Almost without exception some kind of spotting will be observed on the lower parts. Why, therefore, should tobacco be an exception? It is thus obvious that one of the conditions favourable to attack by Frog Eye is over-ripeness of leaf or, in other words, delayed reaping. General experience seems to show that the disease is more severe during periods of continued rain, which evidently favour the development of the fungus and production of spores. High winds and driving rain will then assist in spreading the spores throughout the lands, and rapid germination will take place owing to the presence of an abundance of moisture. In the barns, high humidity and temperatures of from 90 to 100 degrees stimulate the germination of spores and growth of the fungus in isolated spots, so that even clean leaf with spores adhering to the surface will become affected after curing has been in progress for some time. Usually, however, the centres of infection can be detected upon newly reaped leaf if it is held up to the light, when they appear as minute points of paler green than the surrounding tissues.

It was stated above that Frog Eye appears in the seed bed, and this phase of the disease is usually overlooked or else attributed to angular spot (*B. angulatum*). How far it is concerned with the appearance of the spot in the lands is not fully understood, but it is reasonable to suppose that a certain amount of infected material must be transferred from the seed beds when planting out. The spotted leaves will admittedly be removed from the plant by the first or second priming, but they will remain as a source of danger unless all the primings are taken from the lands and destroyed. As this procedure is not usually adopted unless angular spot or wildfire (*B. tabacum*) is present, there seems to be every likelihood of Frog Eye in the latter part of the season originating from the early primings. The occurrence of the disease in the seed beds is governed largely by the

condition of the plants. Strongly growing plants of a good colour have never been observed to be infected; it is those which have been left too long before pulling or are turning yellow as a result of nitrogen deficiency which are attacked. Frequently it has been noticed that the majority of seedlings in a bed are of a desirable type, but that in a few places small patches of yellowish and stunted plants occur, due to irregular distribution of fertiliser or uneven burning of the soil. It is upon these unhealthy individuals that Frog Eye spots may be observed, and it is the opinion of the writer that this condition may be an important factor in the subsequent infection of the maturing crop.

**Control.**—Because the disease is usually first noticeable in the lands upon the more mature leaf, the principal control measure involves the removal and destruction of infected material before the fungus has produced spores in abundance. It has been found that where priming is carried out assiduously, Frog Eye can be kept within reasonable bounds in the lands, and consequently the black barn spotting does not assume serious proportions. It is, however, essential that spotted leaves be removed as soon as the disease is recognised and that all infected primings be destroyed by burning or burying deeply. This necessity for thorough priming as a prevention against leaf diseases has been constantly advocated for the past three years, and there seems to be little hope of obtaining adequate control of fungoid leaf affections such as Frog Eye and White Mould (*Erysiphe cichoracearum*) unless these recommendations are adopted as normal routine methods.

Experimental figures obtained this year show definitely that there is no reduction in yield of marketable leaf when plants are primed to leave as much as two feet of bare stalk.

The second matter to be considered is reaping. Since Frog Eye more readily attacks mature leaf, every effort should be made to get the crop into the barns as soon as it is in a suitable condition. Unfavourable weather cannot, of course, be overcome, but insufficient labour or barn accommodation and delay in reaping should be avoided. The black barn spot can be prevented to a great extent by regulating the moisture during the early stages of curing. It has been

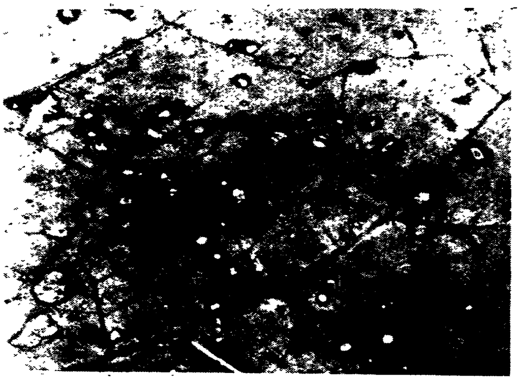

Fig. 1.

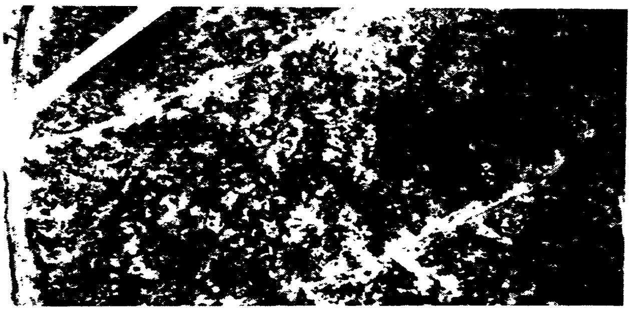

Fig. II

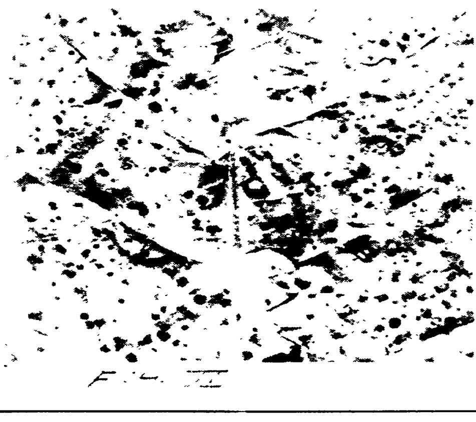

Fig. III

Fig. I. Frog-eye spot on bright leaf.
Fig. II. Black barn spotting on heavy textured leaf (Herbarium specimen).
Fig. III. Black barn spot on bright leaf.

demonstrated by a number of farmers in the Colony that ample ventilation and low moisture during the early stages of curing are effective in reducing the spotting to small proportions. Another method which is reported as obtaining a large measure of success, but is attended by a certain amount of danger, is to run the temperature in the barns up to 160° F. as quickly as possible and then to rake out the fires and allow the barns to cool to the normal temperature. Curing is then proceeded with in the usual way. The idea of subjecting the leaf to a high temperature is to kill the fungus, but whether this is accomplished has not been proved. It is suggested by Butler (1) that more probably the invaded cells of the leaf are killed and that the fungus, unable to live upon dead material, remains in a dormant condition. In any case, the method should be tested cautiously, owing to the danger of ruining the colour of the leaf; but there are a few farmers in the Colony who regularly practise this method of control when spotting is bad in the barns.

The prevention of the disease in the seed beds involves the careful preparation of the soil and even distribution of fertiliser in order to raise strongly growing plants. The regular use of Bordeaux Mixture (4—4—50), as advocated in a previous bulletin (2), will also assist in eliminating leaf-spotting fungi. Finally, since the disease almost always appears upon plants which are allowed to remain in the beds after planting out is completed, all old beds should be dug over and the plants destroyed as soon as possible.

## SUMMARY.

1. Frog Eye is a common leaf spot caused by the fungus *Cercospora nicotianæ*.

2. It may appear in seed beds and the lands and cause a serious black spotting in the barns.

3. It is sometimes difficult to distinguish from angular spot, and may be confused with this disease.

4. It is controlled by priming in the lands, reducing moisture in the barns and spraying the seed beds.

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2. Hopkins, J. C. F. "The Care of Tobacco Seed Beds." Bull. 653. Department of Agriculture, S. Rhodesia. September, 1927.

## EXPLANATION OF FIGURES.

Fig. 1.—Typical Frog Eye spot on bright leaf.

Fig. 2.—Black barn spotting on heavy textured leaf (Herbarium specimen).

Fig. 3.—Black barn spot on bright leaf.

# Dehorn your Commercial Cattle.

By W. FLEMING, Stock Adviser.

The dehorning of commercial cattle has recently received such striking endorsation by prominent live stock breeders as should result in its general practice all over Southern Rhodesia. It is confidently expected that for strictly economic reasons breeders and feeders of live stock will unite in a wide movement to eliminate horns on their commercial cattle within the next few years.

Experience has proved the great advantage from every standpoint of dehorning cattle, and that a great benefit would accrue to the live stock industry of Southern Rhodesia if all our commercial cattle were dehorned. Every effort should therefore be made to attain this object, and it deserves the active support and co-operation of the Press and all organisations interested in the live stock industry to encourage the practice of dehorning calves at the age of from three to ten days old.

The present day price of meat is an indication of the vital necessity of encouraging maximum gains in cattle for feed consumed, resulting in obtaining maximum market prices and eliminating waste. It is an £ s. d. proposition, and in this age of high production and marketing costs deserves earnest attention.

Dehorning is no fad. It is a market requirement. Horns are a handicap to commercial cattle; they add to the cost of production and discount the selling value of the animal. Your feed supply cannot stand wastage. From the calf-pen to the block, horns are a bill of expense to the producer and feeder. They are of no economic value to the farmer, butcher or exporter, but are often the cause of unthriftiness, discontent and injury in the feeding pens,

resulting in the placing of second-class goods on the market and causing heavy losses in killing. Every year thousands of pounds sterling are lost to the farmer through a lack of that even temperament in the herd so necessary to economical production and an equal chance for every animal in the herd, and through the cut in the market price levied on bruised and torn cattle. The value of feeding steers already dehorned is abundantly proved by experiment and experience. Dehorning permits of loose feeding, a method very suitable to our climatic conditions and conducive to good gains in weight.

Live stock feeders and dealers find that dehorned stock is more easily loaded into a truck. The cattle show less shrinkage and damage in transit and more economy is effected. Cattle salesmen make quicker sales at higher prices with dehorned stock, whether for butchering or for store purposes, since such cattle make up more evenly in lots, have a better appeal to the eye and guarantee more freedom from bruises than do horned cattle. It is for these reasons that all cattle breeders should practise dehorning.

Dehorning calves is a simple operation and the easiest way to remove the horns is by the use of caustic potash when the animal is only a few days old. Caustic potash is sold in sticks and may be purchased from any chemist. To get the best results, the operation should be done before the calf is over ten days old. Up to and before that age the young horn is only loosely attached to the skull and is more a part of the skin than of the skull itself.

**Directions.**—First clip off the hair over and around the horns and apply vaseline around the edge of the hair after the clipping. This prevents the caustic potash from spreading beyond the horny surface. Now moisten the end of the caustic and rub it on the surface of each horn. In some cases where the calf is over five days old it may be better to give the horns a second rub with the caustic. Where there are a number of calves to treat the animals should be tied up in line. The operator should work down the line, and by the time the last animal is reached the caustic will have dried sufficiently on the first one to allow of the second application.

The stick should be wrapped in paper to prevent it burning the hands. Do not wet the stick so much that it runs. Do not let the calves out in the wet for a few hours, or the caustic may be washed off.

After the calf is over ten days old it is necessary either to saw or clip off the horns. The dehorning clippers are quicker, and whilst in either case any pain caused is largely momentary, the clippers are less painful to the animal. Removing the horns during the early calf stage leaves the head in better shape, a condition very desirable where heifers are to be retained for the breeding herd. Where the clippers are used precaution is necessary, and to prevent fly trouble apply some efficient fly preventive immediately after dehorning. Coal tar or products of coal tar are satisfactory and are non-irritants.

There are several other means of dehorning practised, but caustic stick is considered by the writer to be the most desirable.

# Talks to Poultry Keepers.

## THE CARE OF CHICKS.

Issued by the Poultry Branch, Department of Agriculture.

It is not only necessary to select the best breeding stock and the best hatching eggs, but the chicks also must receive every possible attention. These points must go hand in hand if good stock is to be expected. Rearing will make or mar the birds, and during their growing stage they must *never* be neglected. Do not bother about weak or deformed chicks; kill these as soon as possible, for it is waste of time to try to rear them. Strong chicks should never run with weaklings. It is the latter that are the first to become sick, and if it is an infectious disease, to spread it. Intestinal chills are one of the chief causes of illness of young chicks.

Never let the young chicks get cold at night, never let them out when a cold wind is blowing and never over-crowd them. Chronic indigestion is a common chick ailment, and this is usually due to wrong treatment at the beginning. When the chick hatches out it takes into its body the yolk of the egg, which is its natural food and on which it can live for some time, and thus day-old chicks can be sent some distance without being fed. This yolk is gradually absorbed into the digestive system through vessels connecting it with the intestinal tract. If it does *not* pass away it becomes hard and cannot be absorbed; the chick then dies, or it may live for a time, but ultimately dies before it is six months old. If the yolk is to be absorbed naturally, no food must be given for thirty-six or forty-eight hours. The first two weeks of a chick's life is the risky period; if it can be got safely over this, given good treatment it will usually get on all right.

**The Culling and Grading of Chicks.**—Every chick that is hatched should not be kept; the weaklings and those with any deformity should be got rid of at once. The weaklings are those which hang about doing nothing, are inactive, listless and are continually cheeping in a plaintive fashion. Under deformities we have straggle legs, twisted and in-curved toes, cross beak, roached back, slipped hip and bobbed tails, etc.

In grading and culling the chicks, the cockerels should be more severely culled than the pullets, for the pullets will give eggs, whereas the cockerels are only of use as breeding stock; therefore only sufficient should be kept for the owner's breeding stock and a few for selling. In addition to culling as above, when the chicks are a day old the abdomen should be felt below the pelvic bones; if a hard substance is felt in it, this is a hard yolk, a yolk that is not properly absorbed and never will be. This chick will die, therefore it should be killed at once. Those chicks with a soft, pliable feeling in the abdomen should, other points being good, be kept. Again, when a day or two old the kind of gait the chick has should be noted; the poor one will walk on its toes, the good one on the soles of its feet. When a month old it is possible to distinguish the really good from the bad, and for the following faults chicks should be graded out:—

Thin spindly shanks.
Thin long beaks.
Flat chest.
Cut-away abdomen.
Small appetite.
Being easily bullied.
Triangular-shaped bodies.
Handling light for age.
Narrow backs.
Narrow bodies.
Knock knees.
No space between the legs.
Rounded breast bone.

The good points are as follows:—
Naturally the opposite to those above.
Body heart-shaped.
Wide pelvic arch.
Neat beak and shanks.
Plumpness.
Straight pelvic bones, which are also fine and wide apart.

Grade out severely all males showing the bad points enumerated above, also those whose combs flop over and whose legs are long. To ensure good stock the birds *must* be graded very drastically, and when in their growing stages they must be graded frequently.

# African Coast Fever.

## WHO IS TO BLAME?

By J. Park Hamilton, District Veterinary Surgeon, Gwelo.

The news of an outbreak of African Coast Fever is received by stock owners and public alike with grave apprehension, and that this should be so is easily understood when it is remembered how outbreaks in the past have caused so much trade dislocation as well as loss to those intimately concerned. It appears to be a general belief that where cattle are regularly dipped every week African Coast Fever should not occur, and if it does occur, that it indicates slackness on the part of the owner or the Veterinary Department or both, and one frequently hears the question, "Who is to blame?"

Another outbreak of African Coast Fever was recently reported a few miles from Enkeldoorn, and the same question is being asked, not only by the public, but by the owner of the infected farm, who, in addition, says, "What is the good of my having dipped and my farm being inspected every month by the cattle inspector, and yet I now have African Coast Fever?" The facts are that a cattle owner may conscientiously carry out the regulations regarding dipping and be careful to report cases of sickness and deaths among his cattle and still be the victim of an outbreak of African Coast Fever, but—and this is important—when an outbreak occurs under such conditions the mortality will be usually small and the outbreak more easily controlled. In other words, the cattle owner has protected himself in the same way as we are protected by vaccination for small-pox: we may still get the disease, but with a greatly decreased virulence. It can likewise be contended that in a case where a stock owner does not dip efficiently, not only does he not have his cattle protected to any great

extent against African Coast Fever, but should he get an outbreak, the increased resulting infection makes his farm a menace to the district. This protection is naturally a matter of degree; for example, a farm where dipping and supervision have been properly carried out over a period of years is protected to a much greater degree than where dipping and supervision have existed for only a short time. I think if this viewpoint was more generally understood that cattle owners would realise more the necessity for not relaxing efforts, so as to get their cattle protected to the highest degree.

The history of African Coast Fever in the Charter district is a good illustration of the transition stage from the time when there was little protection until now, when protection exists to a considerable extent. In 1922 African Coast Fever was discovered in the Charter district, and ultimately many centres of infection were found. At that time there were few dipping tanks in the district—about thirty—and the result was that some of the outbreaks were accompanied by high mortalities of as much as 60 per cent. of the affected herd. To-day in the Charter district there are 143 dipping tanks, and there have been sufficient cattle inspectors posted to ensure that dipping is being carried out, and reported deaths and sickness investigated.

Under these improved conditions an outbreak of African Coast Fever occurred in 1927 at the farm Wildebeestelaagte, affecting 724 cattle, and the resulting mortality from the disease was fourteen deaths, or just 2 per cent. The same year a single case of the disease occurred on the adjoining farm Pennyfather among 293 cattle. In addition to the lessened mortality in these two outbreaks, it was recognised that there could have been little spread of the disease, so that the district benefited by only a small area being quarantined. A similar history could be written about the last Hunter's Road outbreak in 1926.

The reason of outbreaks occurring in old affected areas several years afterwards is difficult to explain and is not the subject of this article, except to point out that even in cases of recurrences, where dipping has been carried out efficiently in the intervening period, there should be only a small number affected, and therefore a decreased risk of infection left, so that eventually African Coast Fever may disappear from all such areas.

# South African Oranges on the London Market.

## MORE COMPETITION IN FUTURE.
## BIG INCREASE IN WORLD'S OUTPUT.

Orange production in South Africa may easily be trebled or quadrupled within quite a short time, according to a survey of world production and trade in oranges just issued by the Empire Marketing Board (H.M. Stationery Office, London; 1s. net). Of the total acreage under oranges in the Union, only about one-fifth was in full bearing in 1927, and little over one-half was yielding any appreciable amount. Practically the whole of South Africa's surplus, adds the report, has found its way in the past to the United Kingdom, which received 8½ times as many boxes of the fruit in 1927 as in 1920.

An enormously increased output of oranges is imminent, not only in South Africa, but in every other orange-growing country of importance, within the next few years. In the United States, which supplies the London Market with the same proportion of oranges as South Africa, namely, 6 per cent., production may well reach a total of over 50 million boxes in 1932 as against less than 40 million in 1926-27, which would result in heavier exports.

Extensive plantings have recently taken place in Spain, from which country the United Kingdom obtains 67 per cent. of its total orange supply. The area under cultivation in Palestine, which accounts for 17 per cent. of the British imports, more than doubled between 1924 and 1928; and production in this country is likely to increase by at least 100 per cent. in the next few years.

Countries with a smaller export trade, such as Rhodesia, Cyprus and Australia, are also producing increasingly large quantities of oranges. Southern Rhodesia sent its first ship-

ment to the United Kingdom in 1916, consisting of 1,300 boxes; by 1927 this figure had risen to 118,069 boxes.*

South African oranges, arriving in London between June and November, have hitherto had to face little competition, but it appears probable that they will not have the field to themselves in the future. Brazil is now starting to cultivate an export trade to Europe, and it is anticipated that there will be a rapid increase over the 200,000 boxes she shipped to European markets last season. Further, the heaviest shipments of United States oranges—which arrive all the year round—reach Covent Garden between May and November, and South Africa will have to meet increasing competition from this source.

The United Kingdom is the world's largest importer of oranges, taking one-third of all the oranges which enter the channels of world trade. Before the war, average annual imports amounted to between 5 and 6 million cwts., whereas since 1923 the figure has lain somewhere between 7½ and 8 million cwts.

Although consumption has gone up, it is not certain that it will be able to keep pace with production unless the price to the consumer goes down; and the bigger quantities of culled fruit which are likely to result from the stricter grading standards which will follow increased competition, render it very necessary that a market should be found for by-products such as fruit juice, marmalade juice, pulp and oil, if orange culture is to continue to pay. A very promising solution is the extraction of juice for "soft" drinks, and it is stated that about 56,000 juice extractors have been issued recently in the United States, and that these machines now account for about 3 million boxes of fruit a year.

Only about 9 per cent. of Covent Garden's annual orange supply arrives during the summer months, and if consumption during this period, which is at present only moderate, could be encouraged, it would meet the increased production expected in South Africa, the United States and Brazil. It is, however, largely a matter of price, because in that season an abundant supply of home-grown soft fruits is available to the British consumer. Under present conditions, oranges in summer are more or less of a luxury fruit.

* In 1929 the total was 178,000 cases.—Ed., *R.A.J.*

# Praise for South African Beef.

It is not generally known that early this year a section of the Italian Press was loud in its praises of South African meat. One article dealt in particular with the shipments of South African meat which had been conveyed to Italy by the steamships "Sabba" and "Maiella" for private sale and for military contracts. An expert stated that the imported South African frozen meat came from Natal, South-West Africa, less frequently from the Cape, and from Rhodesia *via* Durban. It arrives in a perfect condition of preservation. The meat from Natal embodies excellent characteristics from a hygienic point of view as well as in nutritive quality, the muscular mass in the quarters being abundant and proportionately larger than that found in other beef, while the fat is of pleasant taste and not excessive in quantity.

**Meat "As it should Be."**—Another section of the statement says that South African frozen meat is washed and bled as it should be, and the colour of the muscular mass is a beautiful rosy-red. It is firm, slightly moist on the outside, fine in grain, and has a fresh and sweet odour. Having been inspected in the country of origin, it arrives in Italy in perfect condition and well frozen. Every quarter and every sack containing boned meat, as well as cases containing viscera, are invariably accompanied by a certificate from the health authorities showing the place of origin, quality of the meat, and date when slaughtered, together with a certificate from the veterinary inspector that the meat has been inspected and passed. It is added that, being highly nutritive, a large proportion of the South African frozen meat imported into Italy is destined for the use of the Army and Navy. A high military authority has expressed his opinion of it in most favourable and eulogistic terms, stating that it had been proved and was still being demonstrated that the meat coming from South Africa responds perfectly to every requirement that must be possessed by a good food for the troops. This is obviously a very fine advertisement for South Africa, and it is surprising that it has not been made more use of.—*Ice and Cold Storage*, June, 1929.

# American Tobacco Trade, January to April, 1929.

The exports of leaf tobacco during the first four months of 1929 amounted to 164,813,000 lbs., valued at $39,250,000, representing a decline of 5 per cent. in quantity and 12 per cent. in value from a corresponding period of last year, according to an interpretation of official data by the tobacco section of the Department of Commerce.

Owing to heavy shipments of flue-cured tobacco to China during the latter part of 1928, and a consequent accumulation of stocks in that country, the exports of bright flue-cured weakened during the period by 16 per cent., and amounted to little more than 100,000,000 lbs. Exports of flue-cured tobaccos to the United Kingdom, however, increased by 4,368,000 lbs., and to Canada by 1,353,000 lbs. Belgium, Java and Madura also increased their purchases, but material losses were noted in the flue-cured trade with Australia and New Zealand.

**More Dark-Fired Used.**—A material strengthening of the market was noted in dark tobaccos, especially in dark-fired Kentucky and Tennessee. The Netherlands, Germany, the United Kingdom, Portugal and Argentina all show increased consumption of darks against the first four months of 1928. Exports of dark-fired Kentucky and Tennessee amounted to 34,325,000 lbs.—an increase of nearly 4 per cent.; exports of dark Virginia amounted to 6,786,000 lbs.—an increase of 15 per cent.

Maryland and Ohio Export, and Green River, also increased in the export trade of the period by 23 per cent. and 16 per cent. respectively; Burley declined by 23 per cent.

Owing to a decline in the exports of cigarettes, which represent 90 per cent. of the total export trade in tobacco products, there was a considerable falling off in the export value of products, only $7,932,000 worth being exported, compared with $8,162,000 worth during the first four months

of last year. In the cigarette trade, China as a major market weakened by 14 per cent.; nearly all the minor markets, however, showed healthy increases.

**Imports.**—The total imports of leaf tobacco during the first four months of 1929 amounted to 29,372,000 lbs., compared with 26,933,000 lbs. imported during a corresponding period of 1928. The increased importation was due mainly to an increase in the direct imports from Greece to replace depleted stocks occasioned by light imports from that country during the calendar year 1928. Increased quantities were also brought in from the Philippine Islands, but the imports of other cigar tobaccos were lighter than during the first part of last year.

**Domestic Consumption.**—Compared with the first four months of 1928, increased quantities of tobacco have been used in domestic factories in the manufacture of cigarettes and cigars, according to the monthly stamp sales recorded by the Bureau of Internal Revenue. The production of cigarettes for the first four months of 1929 amounted to 36,524,000,000, compared with 31,886,000,000 last year; owing to an increased consumption of 5-cent cigars, the production of cigars increased by 101,000,000 and amounted to 2,052,000,000 in number. The output of manufactured tobacco and snuff has declined during the current year.—(*Tobacco.*)

DEPARTMENT OF AGRICULTURE,
P.O. Box 387, Salisbury.

# Notice to Prospective Cotton Growers

Bona fide farmers desirous of growing U. 4 Cotton in the forthcoming season, and who wish to have seed from the farm increase-plots grown under agreement with the Government, should register their names with the undersigned, indicating

nearest railway station (not siding) before the 1st of September, 1929, after which date no applications will be entertained.

Applicants should state the acreage they desire to plant. As, however, seed is limited, the quantity available for each farmer will depend upon the number of applications received by the above-mentioned date.

Seed will be sold without guarantee, price 1½d. per lb. f.o.r. Salisbury.

Seed will be consigned carriage forward to nearest railway station.

After allocation of seed, applicants will be notified of the amount allotted to them, and they will be required to remit cost thereof within three weeks of date of notification from the above office.

## SELECTED U. 4 SEED FROM THE COTTON BREEDING STATION, GATOOMA.

It is proposed to issue bulk selected U. 4 Cotton Seed, in 10lb. packets, from the Government Cotton Breeding Station, Gatooma, that farmers may have an opportunity of planting their own seed plots with a view to using the improved seed for their bulk planting the following year.

The amount of this seed is strictly limited. Applications should be made to the undersigned before the 1st of September, 1929, after which date allocation will be made by ballot.

Farmers are limited to one package of special seed, which will be forwarded by registered parcel post to any address in Southern Rhodesia. The cost is £1 (one pound sterling), which amount should be forwarded with the applications.

G. S. CAMERON,
Cotton Specialist,
Empire Cotton Growing Corporation.

# Movements of New Settlers.

The following new settlers arrived in this Colony during the month of June, 1929:—

T. K. Davies.—Arrived from Australia on 4th June on tour of inspection.

F. Weber.—Arrived from Great Britain on 10th June and proceeded to Mr. H. B. Christian, Ewanrigg, Arcturus, for a period of training.

Mr. and Mrs. K. G. Gunn and Family.—Arrived from Great Britain on 10th June and proceeded to the Gwebi Government farm for a period of training.

Mr. and Mrs. R. S. Wright and Family.—Arrived from Great Britain on 10th June and proceeded to Riversdale Estate, Mazoe.

C. Elgar.—Arrived from Great Britain on 20th June and proceeded to Mr. Syfret, Springs, Salisbury, for a period of training.

Mr. and Mrs. A. P. Jamieson.—Arrived from the Union of South Africa on tour of inspection.

L. P. Archer.—Arrived from Great Britain on 28th June and proceeded to Mr. Newhook, Homefield, Salisbury.

Capt. A. D. Collins.—Arrived from Great Britain and proceeded to Capt. Duff, Chinota Ranch, Tsungwesi, for a period of training.

T. V. H. Margesson.—Arrived from Great Britain and proceeded to Mr. Ossenton, Thabanchu, Melsetter, for a period of training.

# Southern Rhodesia Veterinary Report.

## April, 1929.

### AFRICAN COAST FEVER.

MAZOE DISTRICT: An imported bull died on the farm Richlands, and smears revealed Koch's bodies. The farm was placed in quarantine.

Several deaths occurred on the farm Sunridge; upon investigation African Coast Fever was diagnosed and 24 cases were recorded. One ox, which was moved from this farm to Mari Plumbi, was destroyed and found to be infected.

MELSETTER DISTRICT: One case occurred on each of the infected farms Morgenson and Enhoek.

CHARTER DISTRICT: A cow died on the farm Victor, and African Coast Fever was diagnosed. Mortality 2.

### HORSE-SICKNESS.

A very heavy mortality occurred during the month; 112 deaths were reported as follows:—Bulawayo district 47, Victoria 3, Umtali 2, Salisbury 20, Melsetter 10, Gwelo 30.

### CUTANEOUS MYIASIS (SCREW WORM) IN CATTLE.

A few cases reported from Bulawayo and Salisbury districts.

### TRYPANOSOMIASIS.

Several cases in Lomagundi; Gatooma 14, Melsetter 5, Matetsi 4.

### SWEATING SICKNESS IN CALVES.

Very few cases of this sickness have been reported.

## IMPORTATIONS.

From the Union of South Africa: Bulls 112, cows 88, heifers 189, calves 20, horses 25, mules 14, donkeys 18, sheep 1,252, goats 360.

## EXPORTATIONS (CATTLE).

To Union of South Africa: For local consumption 242, for overseas 1,842. To United Kingdom: 75. To Belgian Congo: Slaughter 2,933, breeding 1,131. To Portuguese East Africa: Slaughter 38, breeding 22.

## EXPORTATIONS (MISCELLANEOUS).

To Union of South Africa: Pigs 84, horses 8. To Belgian Congo: Horses 9, mules 1, sheep 70, pigs 218. To Northern Rhodesia: Sheep 129, goats 3.

## COLD STORAGE EXPORTS TO THE CONGO.

Beef: Carcases 180, tails 173, cheeks 307, livers 190, tongues 333, hearts 276, brains 59, tripes 40. Calves: Carcases 78, heads 26, livers 23, hearts 38, feet 125, plucks 16. Goats: Carcases 15. Pigs: Carcases 54.

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# May, 1929.

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## AFRICAN COAST FEVER.

Melsetter District: A fresh outbreak occurred on the farm Hartebeest Nek; one animal only infected. There was no mortality at any of the other infected areas.

Mazoe District: Ten head were destroyed on Sunridge.

Charter District: Two cases occurred on the farm Victor.

## HORSE-SICKNESS.

The following mortality was reported:—Bulawayo district 16, Beatrice 4, Melsetter 5, Salisbury 2, Marandellas 1, Mrewa 1, Victoria 2, Gwelo 3, Selukwe 2, Charter 1.

## CUTANEOUS MYIASIS (SCREW WORM) IN CATTLE.

A few cases reported in the Hartley, Mazoe and Umtali districts. Prevalent in Matabeleland.

## TRYPANOSOMIASIS.

Several cases recorded. Wankie 15, Lomagundi 1, Melsetter 13.

## SCAB.

Four flocks were placed in quarantine in the Melsetter district and one in the Selukwe district.

## MORTALITY IN SHEEP.

The District Veterinary Surgeon, Gwelo, reports as follows:—

"A considerable mortality occurred in two flocks at Belvoir Spinney and Jackalsbank, and I am not sure of the disease, but from the symptoms it would appear to be a feverish condition akin to blue tongue.

"The sheep lose condition rapidly, there is a complete loss of appetite, but the marked symptom is the eruption on the skin, affecting head, ears and over the body.

"The skin on such animals becomes very hard and board like; in both outbreaks the owners thought the condition was scab and dipped the sheep, which resulted in a further large mortality, probably owing to the irritation and shock of an arsenical dip when the skin was in an intensely inflamed condition. In the Jackalsbank sheep 40 died, and after dipping, 60 of the remainder died in the next few days."

## IMPORTATIONS.

From the Union of South Africa: Bulls 146, cows 65, heifers 211, calves 8, horses 64, mules 89, sheep 3,191, goats 467.

## EXPORTATIONS.

Union of South Africa: For local consumption 224, for overseas 4,318. United Kingdom: 620. Congo Belge: Slaughter 1,508, breeding 2,966. Northern Rhodesia: Breeding 17. Portuguese East Africa: Slaughter 24.

## EXPORTATIONS (MISCELLANEOUS).

Union of South Africa: Pigs 128. Northern Rhodesia: Pigs 3, sheep 125, goats 52. Congo Belge: Horses 10, pigs 243, sheep 119, goats 3.

## COLD STORAGE EXPORTS TO THE CONGO.

Beef: Carcases 231, forequarters 14, hindquarters 14, tails 160, tripes 10, brains 180, hearts 150, livers 113, cheeks 172, tongues 100. Calves: Carcases 38, heads 10, feet 12, plucks 25, tongues 12. Sheep: Carcases 113, tongues 50, brains 72. Pigs: Carcases 65.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

# Southern Rhodesia Weather Bureau.

## JUNE, 1929.

**Pressure.**—The pressure during the month was slightly below normal at Salisbury and Victoria.

**Temperature.**—The mean temperature for the month was high, varying from 2.3° F. above normal at Melsetter to 1.5° F. below normal at Juliasdale.

The mean maximum temperatures were about normal, varying from 2.5° F. above normal at Melsetter to 4.5° F. below normal at Hartley.

The mean minimum temperatures were above normal, varying from 3.1° F. above normal at Gwelo to 4.3° F. below normal at Sinoia.

**Frost.**—Little frost has been recorded. 9° of frost occurred on one night at Victoria, and the majority of stations recorded from 1 to 2°.

**Snow.**—Snow in the form of very minute flakes was observed at Salisbury Gaol on one occasion during the month.

**Rainfall.**—The usual winter showers were recorded during the month.

ZONE A.—

Insiza—

| | |
|---|---|
| Shangani | .03 |
| Thornville | .43 |

Umzingwane—

| | |
|---|---|
| Springs | .23 |

ZONE B.—

Belingwe—

| | |
|---|---|
| Bickwell | .41 |
| Wedza | .37 |

| | |
|---|---|
| Bulalima-Mangwe— | |
| Garth | .18 |
| Semokwe Reserve | .07 |
| Chibi— | |
| Mtendelende | .31 |
| Nuanetsi Homestead | .32 |
| Insiza— | |
| Albany | .33 |
| Inyezi | .26 |
| Lancaster | .33 |
| Scaleby | .26 |
| Matobo— | |
| Bon Accord | .01 |
| Holly's Hope | .13 |
| Longsdale | .07 |
| Mtshabezi Mission | .15 |
| Umzingwane— | |
| Essexvale | .18 |

ZONE C.—

| | |
|---|---|
| Charter— | |
| Enkeldoorn | .09 |
| Marshbrook | .05 |
| Gwelo— | |
| Cross Roads | .20 |
| East Clare Ranch | .03 |
| Lannes Farm | .04 |
| Lalapanzi | .24 |
| Woodenhove | .22 |
| Wold Farm | .29 |
| Hartley— | |
| Carnock | .09 |
| Meadowlands | .11 |
| Pulham | .26 |
| Lomagundi— | |
| Argyle | .04 |
| Between Rivers | .02 |
| Palm Tree Farm | .03 |
| Sinoia | .02 |
| Yeanling | .30 |

| | |
|---|---|
| **Marandellas—** | |
| Rocky Spruit | .18 |
| **Salisbury—** | |
| Ballineety | .18 |
| Cleveland Dam | .02 |
| Gwebi | .30 |
| **ZONE D.—** | |
| **Inyanga—** | |
| Juliasdale | .40 |
| **Makoni—** | |
| Mayo Ranch | .48 |
| Wensleydale | .56 |
| **Mazoe—** | |
| Argyle Park | .10 |
| Bellevue | .34 |
| Bindura | .11 |
| Citrus Estate | .32 |
| Craigengower | .09 |
| Donje | .08 |
| Glen Divis | .18 |
| Glen Grey | .01 |
| Great B | .09 |
| Kilmer | .28 |
| Kingston | .26 |
| Mazoe Dam | .39 |
| M'gutu | .12 |
| Pearson Settlement | .34 |
| Ruia | .08 |
| Stanley Kop | .13 |
| Virginia | .15 |
| Zombi Farm | .23 |
| **Mrewa—** | |
| Montclair | .10 |
| **Salisbury—** | |
| Arcturus | .11 |
| Chindamora Reserve | .29 |
| Datata | .07 |
| Goromonzi | .23 |
| Kilmuir | .14 |
| Meadows | .29 |
| Pendennis | .05 |
| Vainona | .09 |

| | |
|---|---|
| **ZONE E.—** | |
| **Belingwe—** | |
| Belingwe N.C. | .29 |
| **Bikita—** | |
| Angus Ranch | .31 |
| Bikita | 1.39 |
| **Chibi—** | |
| Chibi | .77 |
| Lundi | 1.35 |
| Mpapas | .63 |
| **Chilimanzi—** | |
| Allanberry | .22 |
| Mtao Forest | .16 |
| Mukowries | .48 |
| **Gutu—** | |
| Glenary | .47 |
| **Gwelo—** | |
| Glencraig | .26 |
| Partridge Farm | .44 |
| **Inyanga—** | |
| St. Trias' Hill | .50 |
| **Insiza—** | |
| Stoneham (Brac Valley) | .39 |
| **Makoni—** | |
| Bude | .27 |
| Craigendoran | .15 |
| Inyagura | .05 |
| Monte Cassino | .04 |
| Whitgift | .31 |
| **Marandellas—** | |
| Elandslaagte | .13 |
| Macheke | .24 |
| Marandellas N.C. | .18 |
| Wenimbi | 1.14 |
| **Melsetter—** | |
| Brackenbury | 1.59 |
| New Year's Gift | .19 |

| | |
|---|---|
| Ndanga— | |
| Doornfontein ... ... ... ... ... ... ... | .86 |
| Triangle Ranch ... ... ... ... ... ... | .60 |
| Selukwe— | |
| Aberfoyle Ranch ... ... ... ... ... ... | .67 |
| Hillingdon ... ... ... ... ... ... ... ... | .57 |
| Rio ... ... ... ... ... ... ... ... ... ... | .17 |
| Safago ... ... ... ... ... ... ... ... ... | .70 |
| Selukwe ... ... ... ... ... ... ... ... ... | 1.01 |
| Umtali— | |
| Argyle ... ... ... ... ... ... ... ... ... | .20 |
| Embeza ... ... ... ... ... ... ... ... | 1.05 |
| Fern Valley ... ... ... ... ... ... ... ... | .65 |
| Mutumbara Mission ... ... ... ... ... | .12 |
| Odzani Power Station ... ... ... ... | .40 |
| Park Farm ... ... ... ... ... ... ... | .26 |
| Premier Estate ... ... ... ... ... ... | .25 |
| Sarum ... ... ... ... ... ... ... ... ... | .40 |
| Sheba ... ... ... ... ... ... ... ... ... | 1.33 |
| Stapleford ... ... ... ... ... ... ... ... | .65 |
| Umtali Gaol ... ... ... ... ... ... ... | .51 |
| Victoria— | |
| Brucehame ... ... ... ... ... ... ... ... | 1.26 |
| Cambria ... ... ... ... ... ... ... ... ... | .30 |
| Cheveden ... ... ... ... ... ... ... ... | .70 |
| Kimberley Ranch ... ... ... ... ... ... | .30 |
| Mashaba ... ... ... ... ... ... ... ... ... | .49 |
| Miltonia ... ... ... ... ... ... ... ... ... | .83 |
| Riverdene North ... ... ... ... ... ... | .26 |
| Salemore ... ... ... ... ... ... ... ... ... | .57 |
| Silver Oaks ... ... ... ... ... ... ... ... | .25 |
| ZONE F.— | |
| Melsetter— | |
| Chikore ... ... ... ... ... ... ... ... ... | 1.07 |
| Lettie Swan ... ... ... ... ... ... ... ... | .79 |
| Melsetter ... ... ... ... ... ... ... ... | 1.30 |
| Mount Selinda ... ... ... ... ... ... | 1.39 |
| Vermont ... ... ... ... ... ... ... ... ... | 1.24 |
| Umtali— | |
| Cloudlands ... ... ... ... ... ... ... ... | .60 |

## Dates of Meetings of Farmers' Associations, Southern Rhodesia.

| Name of Association. | Place of Meeting. | Secretary. | August. | Sept. |
|---|---|---|---|---|
| | | | 1929 | 1929 |
| Ayrshire—Sipolilo | Various farms | G. H. Cautherley | 10 | 14 |
| Banket Junction | Banket Hotel | A. M. Hutchinson | 2 | 6 |
| Beatrice District | Farmers' Hall, Beatrice | W. Krienke | 29 | 26 |
| Bindura | Bindura Farmers' Hall | W. E. Fricker | 9 | 13 |
| Bromley | Farmers' Hall, Bromley Siding | E. Taylor | 7 | 4 |
| Bubi | Queen's Mine | C. H. Olsen | 13 | 10 |
| Bulawayo Landowners' and Farmers' Association | Library Buildings, Bulawayo | W. A. Carnegie | 8 | 12 |
| Chakari | Various farms | Lady Codrington | 21 | 18 |
| Daisyfield | Daisyfield (August), Somabula (Sept.) | L. E. Edwards | 17 | 14 |
| Darwendale—Trelawney | Various farms | Charles H. Tanner | 28 | 25 |
| Eastern Districts | Farmers' Hall, Chidza | W. E. Richards | 10 | 14 |
| Enkeldoorn | Enkeldoorn | C. N. Ludlowe | 6 | 3 |
| Enterprise | Farmers' Hall | W. Stobart | 6 | 3 |
| Essexvale | Essexvale | Col. D. Judson | 18 | 15 |
| Felixburg—Gutu | Fairburn (Aug.) | A. J. Bradshaw | 10 | 14 |
| Figtree Branch, R.L. and F.A. | Figtree Hotel | The Secretary | 6 | 3 |
| Gadzema | Gadzema Hotel | H. G. M. Liddell | 9 | 13 |
| Gatooma | Speck's Hotel | Col. J. A. Smith | 17 | 21 |
| Gatooma (Golden Valley Branch) | Golden Valley Hotel | C. K. James | 10 | 14 |
| Gazaland (South Melsetter) | Farmers' Hall, Chipinga | J. Ward | 17 | 21 |
| Greystone | Quarrie Farm | P. J. van der Walt | ... | 14 |
| Gwanda | Lowenthal's Building, Gwanda | N. J. B. Nilson | 17 | 21 |
| Hartley | Hartley Hotel | S. H. Rylett | 10 | 14 |
| Headlands | Headlands | J. A. Eve | ... | ... |
| Hunter's Road | Hunter's Road | R. W. Twilley | 31 | 28 |
| Insiza South | Farm Lancaster | J. Campbell | ... | ... |
| Inyazura | Inyazura | W. P. Frudd | 2 | ... |
| Lalapansi | Lalapansi | B. J. Ingle | 10 | 14 |
| Lomagundi | Sinoia | F. W. Robertson | ... | ... |
| Lomagundi West | Various farms | A. A. Bisset | 11 | 8 |
| Macheke | Farmers' Hall, Macheke | R. O. Jackson | ... | ... |

| | | | | |
|---|---|---|---|---|
| Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association | Various Farms | T. R. Colam | 3 | 7 |
| Makwiro | Makwiro | W. L. Parsons | 16 | 20 |
| Marandellas | Marandellas Farmers' Hall | E. Cruikshank | 2 | 6 |
| Marandellas, Southern | Various farms | B. V. Cherry | 7 | 4 |
| Mashonaland | Mashonaland Farmers' Hall, Salisbury | C. Lamb | 9 | 13 |
| Matobo South | Farmers' Hall, Malundi Farm | A. G. Allan | 17 | 21 |
| Matopo Branch, R.L. and F.A. | Farmers' Hall, Malundi | W. Mirtle | 17 | 21 |
| Mazoe (Concession) | Concession Hotel | A. W. Laurie | 9 | 13 |
| Mazoe (Glendale) | Farmers' Hall, Glendale | James S. Brown | 14 | 11 |
| Melsetter | Court House, Melsetter | J. C. Kruger | 8 | 12 |
| Midlands Farmers and Stockowners | Royal Hotel, Gwelo | T. R. van Rooyen | 14 | 11 |
| Ngezi-Umniati | Harvieston, Enkeldoorn | Miss Harvie | 31 | 28 |
| North Umniati | ——— | J. F. Eagar | Not | received |
| Norton and Lydiate District | Norton | R. D. Palmer | 2 | 6 |
| Nyamandhlovu | Nyamandhlovu | R. D. McLean | ... | ... |
| Odzi District Farmers | Odzi Hotel | F. H. Burnett | 3 | 7 |
| Poorte Valley | Various places | A. D. Wilson | 17 | 21 |
| Que Que | Offices of the Que Que Sanitary Board | A. A. Ackerman | 17 | 21 |
| Rusape Farmers' Association | Rusape | R. Munch | 3 | 7 |
| Salisbury South | Various farms | P. Linton | 28 | 25 |
| Selukwe | The Hotel, Selukwe | W. T. Simpson | ... | ... |
| Shamva | Shamva Court House | W. Stanley-Stollard | 16 | 20 |
| Two Rivers Farming Association | Various farms | W. L. Parsons | 17 | 21 |
| Umboe (Branch of Lomagundi F.A.) | Various farms | C. W. S. Ford | 10 | 14 |
| Umvukwe Farmers' and Tobacco Growers' Association | Various ranches | Com. E. Wrightson | 10 | 14 |
| Umtali | Drill Hall, Umtali | A. Howat | 1 | 5 |
| Umvuma and District | Umvuma | S. T. Montgomery | Not | received |
| Victoria | Victoria | G. E. Lamb | 3 | 7 |
| Wankie District | ——— | F. H. Going | Not | received |
| West Umvukwe Farmers' Association | Various farms | G. H. Gordon | 3 | 7 |
| Western | Plumtree Hotel | The Secretary | 10 | 14 |
| Willoughbys | Willoughbys | A. E. Roberts | Not | received |

# Export of Cattle from Southern Rhodesia, 1929.

| Month | Union | | England. | Congo | | N. Rhodesia | Portuguese East Africa. | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Slaughter | | Slaughter | | | | | | | |
| | Johannesburg | I.C.S. for overseas | On hoof | Slaughter | Breeding | Breeding | Slaughter | Trek | Breeding | |
| January ... | 66 | ... | ... | 2,222 | 272 | 12 | ... | ... | ... | 2,572 |
| February ... | 84 | ... | ... | 656 | ... | ... | 12 | ... | ... | 752 |
| March ... | 12 | ... | ... | 1,845 | 1,803 | 19 | 24 | ... | ... | 5,056 |
| April ... | 242 | 1,842 | 75 | 2,933 | 1,131 | ... | 38 | ... | 22 | 6,283 |
| May ... | 224 | 4,318 | 620 | 1,508 | 2,966 | 17 | 24 | ... | ... | 9,677 |
| June ... | 538 | 6,322 | ... | 2,989 | 936 | 34 | 48 | ... | ... | 10,867 |
| July ... | | | | | | | | | | |
| August ... | | | | | | | | | | |
| September ... | | | | | | | | | | |
| October ... | | | | | | | | | | |
| November ... | | | | | | | | | | |
| December ... | | | | | | | | | | |

J. M. SINCLAIR,

Chief Veterinary Surgeon.

# Rhodesian Milk Records.

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| De Grendel Rita | Friesland | 10,156.50 | ... | 390 | W. R. Blackwell, Norton |
| Astralia ... | do | 5,001.50 | ... | 210 | do do |
| Ogden Hall Alberta | do | 6,910.50 | ... | 180 | do do |
| Dunoran Pearl | do | 7,892 50 | ... | 180 | do do |
| Erin-go-bragh Anne | do | 6,545.50 | ... | 300 | W. Mitchell, Iron Mine Hill. |
| Freesia ... | Grade Friesland | 5,157.50 | ... | 300 | C. E. Strickland, Shamva. |
| Kate ... | Grade Shorthorn | 5,992.75 | ... | 360 | do do |
| Geranium ... | do | 4,841.25 | ... | 270 | do do |
| Jacanda ... | do | 2,201.75 | ... | 120 | do do |
| Nancy ... | do | 2,114.75 | ... | 120 | do do |
| Charmaine ... | do | 2,282.75 | ... | 120 | do do |
| Sally ... | Grade Friesland | 3,647.25 | ... | 180 | do do |
| Betty ... | do | 2,161.50 | ... | 120 | do do |
| Sheeprun Duchess | Friesland | 4,263.00 | ... | 150 | P. T. Webb, Iron Mine Hill. |
| Gertie ... | Grade Friesland | 4,280.00 | ... | 180 | do do |
| A. V. Spinnekop | Friesland | 6,438.75 | ... | 226 | F. Zeender, Insiza. |
| De Grendel Bessie Burger | do | 10,360.25 | 346.91 | 248 | Government Farm, Gwebi |
| De Grendel Stienser | do | 5,592.50 | 162.90 | 133 | do do |
| De Grendel Froukje | do | 2,582.50 | 70.40 | 60 | do do |
| De Grendel de Hoop | do | 3,509.50 | 109.17 | 90 | do do |
| Melrose Maandag | do | 8,041.75 | 301.15 | 287 | do do |
| Melrose Hetta... | do | 7,870.50 | 271.84 | 150 | do do |
| Melrose Corrie... | do | 11,111.75 | 405.19 | 287 | do do |
| Flora of Elsmore | do | 5,809.50 | 184.69 | 124 | do do |
| Mimosa Stienser | do | 3,477.50 | 116.59 | 120 | do do |
| Mimosa Clara X. | do | 16,795.00 | 513.46 | 301 | do do |
| Mimosa Pel Wit Fancy | do | 2,405.00 | 69.76 | 60 | do do |
| Mimosa Pel Fancy | do | 2,712.00 | 97.69 | 60 | do do |
| Mimosa Clara II. | do | 1,231.00 | 50.34 | 30 | do do |
| De Grendel Selma | do | 1,350.50 | 37.62 | 30 | do do |
| Royal Tilford ... | do | 1,123.00 | 31.10 | 30 | do do |
| Gwebi Laura ... | do | 6,481.50 | 229.58 | 245 | do do |
| Gwebi Elsie ... | Grade Friesland | 9,994.25 | 332.43 | 245 | do do |
| Gwebi Gay ... | do | 4,059.50 | 152.83 | 143 | do do |
| Gwebi Princess | do | 4,233.50 | 137.94 | 120 | do do |

## RHODESIAN MILK RECORDS (continued).

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| Gwebi Klein-bloem | Grade Friesland | 3,097.00 | 102.65 | 90 | Government Farm, Gwebi |
| Gwebi Lucy ... | do | 3,442.50 | 101.46 | 90 | do do |
| Gwebi Water-bloem | do | 2,654.00 | 85.02 | 90 | do do |
| Roodebloem ... | do | 4,727.75 | 135.17 | 176 | do do |
| Waterbloem ... | do | 10,375.25 | 306.92 | 221 | do do |
| Isa ... | do | 8,830.50 | 292.39 | 190 | do do |
| Clara ... | do | 6,536.50 | 248.67 | 141 | do do |
| Janie ... | do | 5,104.00 | 181.26 | 184 | do do |
| Fanny ... | do | 7,227.50 | 246.10 | 150 | do do |
| Katie ... | do | 4,939.50 | 139.78 | 120 | do do |
| Lucy ... | do | 4,173.00 | 127.77 | 120 | do do |
| Gladys ... | do | 11,971.00 | 374.14 | 294 | do do |
| Kleinbloem ... | do | 3,556.00 | 120.00 | 90 | do do |
| Hannah ... | do | 5,089.50 | 146.28 | 90 | do do |
| Black Bess ... | do | 912.00 | 41.93 | 30 | do do |

# Farming Calendar.

## August.

### BEE-KEEPING.

This month is one of inaction as far as the apiarist is concerned and the hive inmates are best left alone, except that once a week a corner of the quilt on the top crate may be lifted to see if the wax moth has gained a footing, as may easily be the case in a colony weakened by death from sundry causes, and in which case all such frames should at once be removed. Towards the end of the month, with warmer weather, the bees will be tempted out for play spells, cleansing flights, etc., and, according to the season, entrance stops may be opened out slightly with advantage.

In the workshop see that a spare hive or two are in readiness, well painted and ready for use at any hour; also have in readiness any requisite spares, and see that all appliances, such as veil, smoker, fuel, etc., are handy, for swarms may now go and come at a few minutes' notice. Where the bees have been left to their winter quarters with a fair supply of food, good results can confidently be looked forward to for the coming honey flow of the early winter weeks.

### CITRUS FRUITS.

The first or spring growth should commence about the middle of the month, and the trees should have a good soaking of water when the new growth commences. If Washington Navel oranges are to set their main crop, frequent irrigations must take place from the time of blossoming up to the rainy season. These irrigations create the necessary humid conditions which are so essential to secure a satisfactory setting of this orange. It is advisable to stimulate the growth of unthrifty trees with an application of one to one and a half pounds of nitrate of soda when the first irrigation is given, this application of fertiliser to be followed by good cultivation. The amount of fertiliser recommended is for mature trees. The packing of late varieties will continue throughout the month. No bearing trees should suffer for want of moisture. Irrigation should not take place immediately before the harvesting of export fruit—at least ten days should elapse between irrigation and the harvesting. This is the best month to cut down citrus trees for re-working to better varieties. As the citrus trees are harvested, all dead, diseased and broken branches and shoots should be carefully cut out before the trees come into new growth.

### CROPS.

If not already marketed, the main potato crop will probably be sold about now. Do not forget to grade the potatoes properly according to size. The buyer wants potatoes—table or seed—of even size, not large and small indiscriminately mixed. Select and clean farm-grown seeds ready for next season's planting. Label the bags with name and weight of contents. Build a proper shed for your seed potatoes on the lines recommended in the *Rhodesia Agricultural Journal*. Sort over seed potatoes in store and remove any diseased or rotten. Green oat or barley fodder on wet vleis,

or under irrigation, will become ready for cutting. Press on with ploughing and cross-ploughing. Decide what crops are to be grown next season, and, if you think fit, discuss the matter with officers of the Department of Agriculture. If you have not already effected all your purchases, consider the question of what seed you will require to buy for next season, and discuss the matter with other farmers. If in doubt, consult the Department of Agriculture. In frost-free situations, potatoes can be planted for an early crop under irrigation or on damp land. Cart and spread your farmyard manure and plough it under as soon as spread to avoid loss. If you have any long stable manure, apply it to your heaviest land. The application of phosphatic fertilisers to the land can continue. If you do not already have one, put up an implement shed, even if it be only poles and grass. Keep wagons and Scotch carts under a similar shed or in the shade of trees. Speed up the making and burning of bricks if this is still in progress.

## DAIRYING.

At this time of the year the farmer should experience very little difficulty in producing cream of first-grade quality. As a rule the weather is sufficiently cold to prevent cream, produced under average conditions, from undergoing rapid deterioration, and it is not usually necessary, therefore, to separate a cream of such high butter fat content as is required during the warmer months of the year. During the winter months the separator should be adjusted so as to deliver cream testing 40 to 45 per cent. butter fat.

On exceptionally cold days care should be taken that the milk is not allowed to become too cold before separation—for efficient skimming, the milk should be separated immediately after milking and at a temperature not lower than 90 degrees F.

Farmers engaged in butter-making are usually successful in obtaining a good grain and firm body in butter at this season of the year. Cream can quite easily be cooled to churning temperature if placed outside the dairy and exposed to the atmosphere overnight. During cold weather, however, it is more frequently necessary to warm the cream for churning. The most satisfactory method of warming the cream to the proper churning temperature is to place the bucket or receptacle containing the cream in a tub or bath of water at a temperature of about 95 degrees F., stir the cream frequently and replace the water when cold.

This is usually a critical time of the year for young dairy stock. For dairy heifers, weaned calves, etc., there is possibly no better ration than one consisting of maize silage, legume hay and mixed concentrates, and these feeds, if supplied in liberal quantities, should serve to keep the young stock in a thrifty, growing condition.

## DECIDUOUS FRUITS.

All plantings of deciduous trees should be completed by now, as the late planting of these trees is generally unsatisfactory. Pruning may be continued up to the middle of the month. It is advisable to water or irrigate all deciduous trees before blossoming; if possible, a second irrigation should be given after the trees have set their fruit. Follow up the irrigations with good cultivation.

## ENTOMOLOGICAL.

**Potato.—Early planted crops of potatoes may be attacked by caterpillars. The crops should be sprayed immediately with an arsenical wash.**

**Cabbage Family.—Young plants of this family should be kept sprayed with an arsenical wash to check attack by webworm. Do not spray plants of which the foliage is to be eaten within three weeks of use.**

**Onion.—May still be troubled with thrip. Use tobacco wash or paraffin emulsion.**

**Citrus Trees.**—May be sprayed or fumigated against scale insects, having regard, however, to presence of fruit and blossom. Spraying and fumigating for scale should not be carried out whilst trees are in blossom. Clear young growth of aphis previous to blossoming, using nicotine, tobacco wash or Derris.

**Guava.**—Collect and destroy remnants of late crops to keep down citrus codling, especially if trees are in vicinity of citrus orchards.

## FLOWER GARDEN.

Complete digging or forking over the soil as early as possible. Divide and replant dahlias, delphiniums, Shasta daisies, etc. Plant bulbs—tuberose, arum lilies and gladioli. Sow seeds of hardy annuals. Mulch newly-planted roses, shrubs, etc.

## VEGETABLE GARDEN.

Plant out asparagus, cabbage, cauliflowers, onions and early potatoes. Sow seeds of tomato and other plants that are susceptible to frost in a sheltered position; also seeds of various vegetables and salads for summer use.

## FORESTRY.

Cuttings of ornamental shrubs, roses, etc., struck in sand last month should be transplanted into good soil as soon as they show a good healthy growth of leaves. A large percentage of cuttings will damp off if left in sand longer than about six weeks. No manure should be added to the potting soil. Seed beds should be prepared and gum seeds sown if required for planting early in the season. If the trees are to be grown in seed beds only and not in tins, then gum seeds should not be sown until October, or later, as they will get too large.

## GENERAL.

Fire guards should be completed and every precaution taken to guard against loss of grazing from fires. Natives commence ploughing their softer land this month, and for this reason, as well as because beer is plentiful at the kraals, local labour is apt to be scarce. At this time of the year, however, the need for boys on farms is not so severely felt as later on.

## POULTRY.

By the end of this month all those who are not able to give much attention to the chicks while in the growing stage should have stopped hatching. Those who can give some extra care, can continue hatching for another month, but not later, for chicks hatched after August are usually slow in growth and weedy. They do not lay till some months after they should, and eggs are few in number; in fact, they are generally unprofitable.

Now that the hot weather is approaching, a constant war on insects must be carried out, and of these sand fleas and fowl ticks (erroneously called tampans) will be found to be the most troublesome. A bulletin on fowl ticks can be obtained upon application to the Poultry Experts, Department of Agriculture. Sand fleas, as most poultry keepers know, are found on the face, wattles, ear-lobes and combs of the birds. Application of carbolised vaseline will usually kill them at once, or two or three applications of any ordinary grease on successive days are efficacious. More than this is, however, necessary, for the breeding quarters of these insects (and they multiply very rapidly) are in the dust on the floor of the house and that of the run.

The best preventive is a hard floor (preferably of concrete) with no cracks. If this is not possible, the floor and around the house should be treated every week in one of the following ways:—(1) Thorough soaking with a solution of one teacupful of Kerol, Jeyes, Hycol, Izal, or similar disinfectant to a paraffin tin of water, or (2) with a strong solution of

salt and water, or (3) dusting over and raking into the soil a mixture of one part flowers of sulphur and two parts finely powdered lime.

Ducks.—See that the breeding ducks have plenty of water, and if possible also some to swim in. Keep young ducklings out of the hot sun, otherwise there will be many deaths. The same applies to geese and goslings.

Turkeys.—Young turkeys must be protected from cold at night, for this is fatal to them. Give them as much free range as possible, and do not allow them to run round the house or on the same ground as fowls do. Turkeys like clean ground; any that is tainted is very detrimental to them. Let them find most of their food in the bush.

## STOCK.

Cattle.—On the early granite and sand veld probably the worst of winter is over so far as grazing is concerned, and a nice bite of green grass is appearing. Care should be taken where cattle are allowed to graze on the early burnt grass not to let them get too much at first. On red soil farms the haystack will still be required, and in all cases a certain amount of hay or ensilage should be held in reserve against the possibility of very late rains. The bulls may again be put back into the herds. Any very young calves should be kept near home, and dipping should be carefully attended to. In dairy herds on any soil whatever, feeding, housing and bedding cannot be relaxed. Cows in full milk will benefit by a ration of, say, 5 lbs. of maize (crushed and soaked), 30 lbs. to 40 lbs. of ensilage or pumpkin and 8 or 10 lbs. of hay. If it is possible to give, in addition to the above daily ration, 2 lbs. of peanuts, crushed with the shell, or linseed ground with maize, or oil cake, a very great benefit will be derived. Calves, especially young ones, must be carefully watched; they should not run too far, and are better inside, except when the weather is warm. It will pay to feed to them a little sweet hay, bean meal, linseed, peanuts or peanut cake and a small ration of green food.

Sheep.—Sheep should give little trouble at this time of the year, but on very dry veld a handful of mealies and a little hay or ensilage will materially assist ewes with young lambs.

## TOBACCO.

The seed bed site should be cleared and well ploughed, preparatory to burning and sowing. The usual date of sowing the first beds is the 15th September. Bulletins covering every phase of tobacco culture can be had upon application to the Editor.

## VETERINARY.

Redwater and gall-sickness occur all the year round, although these diseases are more prevalent during the summer months. A good many deaths occur this month, however, amongst imported stock. Vegetable poisoning will probably be in evidence. Sheep can be inoculated against blue tongue. Scab is a poverty winter disease.

## WEATHER.

No rain is to be expected, and even on our eastern mountains the precipitation is trifling. Showers, however, do occasionally fall in places, but are of no consequence. The sun is often warm during the day, but the nights are apt to be cold, and grazing being scarce, food and shelter are necessary for the stock.

# September.

## BEE-KEEPING.

This is an important month for the bee-keeper, as it starts the first flow of the season. All hives that were sent into winter quarters on a double brood chamber, or otherwise with ample food for that period, should now be overflowing with young in all stages and with a population large enough to take full advantage of the flow. All hives should be carefully examined now and again, entrances opened out to suit the advancing warmth of the weather, and where necessary ventilator lids replaced on the top crates under the hive lid. See that no worry is caused to the bees by ants getting up, and that ample stores of good water (with a pinch of salt and a dash of vinegar) are available for drinking purposes, of which bees consume quite a lot. Swarms can now be looked for; if not required, they can best be destroyed by carbon bisulphide or calcium cyanide—both requiring very careful handling. If it is wanted to increase the apiary, as soon as the scouts are seen looking round for a home, get the decoy hive ready filled with dummy and proper frames of full foundation sheets, or, better still, if they are available, old drawn out brood combs, and as soon as it is taken possession of, insert if possible a frame or two of unsealed brood. As a rule the swarm will settle down at once. Such a colony is best placed in the apiary the same evening, if it can be so arranged. Do not make the mistake so often seen of supplying the new colony with starter frames only; give them full foundation sheets; it pays every time, and more especially so in the first early honey flow. Be sure also and protect the apiary against that persistent robber, the honey bear or ratel, by fencing it with fowl netting and pegging that down with wooden pegs every two feet. The two-footed robber can be just as effectively dealt with by placing a small light chain round the entire hive fastened with small staples and a padlock.

## CITRUS FRUITS.

The fate of the citrus fruit crop is dependent upon the treatment the trees receive during this month. If the trees have been given the treatment recommended in the August calendar, and this treatment is followed by good irrigations and cultivation, a good crop of fruit can be expected, whereas a total failure may be the result if the trees suffer for want of moisture at this season of the year.

If not already done, all top worked trees should be headed back early in the month. This cutting back will induce the dormant buds (set in autumn) to commence growth. As the new shoots develop the old tops may be further shortened back until the old top is displaced with a new profitable one.

The packing of late varieties must be speeded up and completed by the end of the month if possible, as the late packed fruit is likely to deteriorate in quality or come into competition with Mediterranean fruits.

All adventitious shoots (water shoots and suckers) must be cut off as they appear, and this work should be continued throughout the growing season.

## CROPS.

Utilise your labour to the fullest extent for stumping and clearing more land for mixed crops and for general farm development. Do not be satisfied unless each year sees more profit-earning development work effected. Good organisation of the farm work will permit of much being done without great cost. Begin marking out holes for hand check-row planting of maize, and apply manure or fertiliser. Fertilisers which are

to be broadcasted and ploughed or harrowed in can be applied. Do not forget that lands which have been green manured in March or April will require a second ploughing about this date or before being seeded to crops. Early varieties of winter cereals ripen this month and require harvesting. Danger from frost should be past now, and crops susceptible to frost, such as potatoes, onions in beds for the summer crop and Jerusalem artichokes, may be planted where lands are moist. Pumpkins and early maize may be planted on vlei lands. Edible canna may be planted "dry" during the latter half of this month, where some rains may be expected during next month. Overhaul all implements and replace worn parts. Putting this off till the planting season may mean serious loss of planting opportunities between rains. Get out the planters and seed drills. Overhaul and place in proper working order. Ploughing and cross-ploughing should be hurried on with; also the ploughing under of farmyard manure. A spiked roller can usefully be employed for breaking down clods, particularly on those lands which are to be planted first. Make every effort to secure as good a seed-bed as possible; good seed-beds mean good stands, and good stands are all-important in securing good yields.

## DAIRYING.

This is generally the quietest month of the year from a dairying standpoint. Most farmers have by this time exhausted their supplies of winter feed and the production of dairy products is consequently at its minimum. Town milk supplies are now falling off, and a greater use of purchased concentrates in the form of ground nut cake and bran is advisable to keep up the milk supply. Very little cheese is made during this month and stocks are naturally low. Old cheese should be cleared out of the storeroom before the advent of hot weather, and if possible should be sent to be stored under cold storage conditions. Considerable difficulty is to be expected in making butter during this month, as the early spring grass is shooting in the vleis and the butter is consequently very soft. To counteract this, greater use should be made of cotton seed cake, of which a small supply is expected to be available this season.

## DECIDUOUS FRUITS.

Newly planted trees must not be permitted to become too dry; watering by hand or gravitation must be continued until the rains commence. Ten gallons of water every fourteen days are sufficient for young trees; these applications should be followed by the loosening of the soil to prevent undue evaporation of the added moisture.

All undesirable growths on the stem and in the centre of the trees should be suppressed as they appear; this will enable the retained shoots to develop normally.

Early fruits must be thinned out this month; only retain two or three fruits on each bearing twig or shoot. Those that are left will then develop into large and attractive fruits.

## ENTOMOLOGICAL.

Cotton.—Prevention for most of the boll-worms will be the proper preparation of the ground, with thorough cultivation and eradication of all weeds on the land, particularly those of the family Hibiscus. Wild host plants for stainers should be sought out and destroyed.

Tobacco.—Young plants in seed-beds may suffer from cutworms. Frequent cultivation and laying down of poisoned bait—50 lbs. bran and 2½ lbs. Paris green; bring to consistency of a stiff dough, adding water when necessary. Distribute this over the seed-beds in the forenoon, as the cutworm does most of its feeding at night. The beds should be thoroughly burnt over with wood or dry tobacco stalks to ensure that the seed-beds are free from cutworms, and baiting for any coming in from the surrounding ground should then be resorted to when the plants appear. Clear the ground for some distance round the beds, say 30

yards in all directions, and bait this ground thoroughly before sowing—this clearance allows a wide margin over which the cutworms would have to travel. Cutworms' moths are nocturnal in habit, so that the coverings of the beds need to be moth-proof at night; this should be seen to each evening.

Potato.—Early potatoes are liable to suffer from caterpillars. The crop should be sprayed at first sign of injury with an arsenical wash.

Cabbage.—During this month the most prominent enemies of plants of this family are diamond-back moth and web-worm. Cabbage louse is sometimes troublesome. The young plants may be sprayed or dusted with an arsenical compound for the former, and sprayed with tobacco wash and soap for the latter.

Beans.—Planted under irrigation during September usually escape serious infestation with stem maggot.

Citrus.—Throughout the month lime-sulphur spray (1-100) may be used to control yellow citrus thrip whilst on very young fruit. A useful spray against black aphis and thrip is the following:—Nicotine, 9 ozs.; Capex spreader, 7 ozs.; water, 100 gallons; Capex lime-sulphur, 1 gallon. This may be sprayed or fumigated against scale insects, having regard, however, to presence of fruit and blossom. Spraying and fumigating for scale should not be carried out whilst trees are in blossom. Clear young growth of aphis previous to blossoming, using nicotine, tobacco wash or Derris.

## FLOWER GARDEN.

Cultivate extensively to prevent evaporation and to keep weeds in check. Water plants newly set out, especially such as have their roots near the surface. Thin and regulate growing shoots on roses and various shrubs. Plant out cannas and chrysanthemums (for massing and border decorations) and other herbaceous plants.

## VEGETABLE GARDEN.

Sow French beans, leek, spinach, cucumber, egg plant, celery, rhubarb, melons and tomatoes. Small sowings of peas, turnips, beet, lettuce, radish, carrot, parsnip may be made now.

## FORESTRY.

All cuttings struck in sand in July and not yet transplanted into good soil should have this done as soon as possible. Tentative sowings of eucalypt seeds should now be made on a small scale, so that transplants will be ready in case the first half of the rainy season should prove favourable; otherwise, bulk sowings should be postponed to October-November.

## GENERAL.

Indigenous labour is apt to become more scarce at this time of the year, the boys returning to their kraals to break up the land for next season. Stock are liable to stray in search of the young grass now coming up, and much trouble from this cause is to be looked for on unfenced farms. Natives are now cultivating their gardens preparatory to sowing their crops, which they do much earlier than do Europeans. The mischief caused by veld burning becomes apparent from this time onwards in the condition of the stock, and it is necessary frequently to move them away in search of grazing.

## POULTRY.

The supply of green food to the birds must be kept up; in fact, during the hot weather they require more.

During our dry season the available supply of such green foods as lettuces, cabbages, sunflower leaves is much reduced, but there are many

others that can be used, such as belhambra, plumbago, wild cockscomb, plantain leaves, paw-paw leaves, etc. Sprouted oats, barley and wheat should also be used. Many of the young cockerels should now be fit for killing. Keep the best and get rid of the remainder. It is very advisable to caponise all young cockerels when about 2½ lbs. weight. Bulletin No. 517 gives clear and concise details as to the method of performing the operation. Some of the earliest hatched young pullets will show signs of commencing to lay now. No light breed bird should lay until it is 5 to 5½ months old, or a heavy breed until it is 6 to 6½ months old. Should any show signs of commencing to lay before this, they should be moved from run to run to prevent their doing so. A bird that lays before it is fully matured will stop growing, will always be small, and its eggs will for its first year of laying also be small.

When the pullets are four months old, i.e., those of the light breeds, they should be put into their permanent laying quarters, and those of the heavy breeds when they are five months old. A bird that is moved after it has started to lay will stop and very probably go into a moult.

See that young ducklings get plenty of shade during the hot weather. Those destined for killing should not be allowed free range or even a medium-sized run, but should be kept fairly crowded in small runs. It is necessary to get the flesh on them as quickly as possible, and the more rest and less exercise they have, the more rapid will be the growth, and also more succulent and tender the flesh.

The hatching of turkeys should proceed rapidly and be carried on until the end of the dry season. See that they have plenty of chopped onions or onion tops or eschalots, and thick separated milk. These are absolutely necessary if the turkey breeder wishes to be successful with his rearing. Do not give wet food; dry mash such as given to chickens is the better.

## STOCK.

Cattle.—Ranching cattle should require little now in a normal season; it is only in the event of very late rains that trouble should be expected. Where possible, it will be wise to keep an eye on those cows that may be expected to calve early, with a view to feeding them if necessary, and seeing that they do not get too poor. The dairyman will carry on much as in August, he will, however, use his discretion (in accordance with the condition of his veld) as to the use of ensilage, pumpkins or other bulky and succulent food. He will be wise not to shorten the supply of concentrated foods for some time to come. A little hay or ensilage should still be kept in reserve until the rains have fallen in reasonable abundance.

Sheep.—The remarks for August apply. If spring lambs are expected, it will be wise to see that the sheep shed is in good order—clean, dry, properly drained and airy. Watch that the ewes shall not be poor when they lamb, and remember that they cannot rear good lambs if the veld is bad, but must have their grazing supplemented, just as milk cows are fed in order to produce milk.

## TOBACCO.

Hasten preparation of seed beds. Begin sowing seed beds each fortnight for the acreage proposed to be planted; fertilise and stimulate growth so as to be ready for planting out should rain come early in November.

## VETERINARY.

There should be very few deaths from redwater and gallsickness this month. Cases of vegetable poisoning of stock picking up tempting young green shoots of dangerous character on the burnt veld are of frequent occurrence. Sheep can be inoculated against blue tongue, but ewes in lamb should not be treated, on account of the danger of abortion. Scab may be prevalent.

## WEATHER.

The temperature may be expected to rise steadily during this month. Rains are not due until next month, though the average over a period of years shows slightly more than in the previous four months, and ranges between .1 and .5 inch. Frost has been known to occur in September, although this is a very unusual event. Rain-gauges should be seen to before the rains commence. They should be carefully adjusted to stand exactly level with the lip four feet above ground, and care should be taken that no tree, building or other obstruction interferes with the fair precipitation of rain into the orifice.

# Notes from the "Gazette."

| *"Gazette" Date.* | *Items.* |
|---|---|
| | POUND. |
| 7.6.29. | A pound has been established at Delville Park Farm, Shabani, Belingwe district. (G.N. 350.) |
| | BRANCH ROAD. |
| 21.6.29. | The following has been declared as a branch road in terms of section 2 of the "Road Regulations, 1896" :— From a point between the 28 and 29 mile pegs, also indicated by a sign-post marked "Lyne" on the main Salisbury-Beatrice Road, going through the farm Gowerlands, owned by Mr. A. Hodson, and terminating at the homestead on the farm Lyne. |
| | HERBAGE PRESERVATION ORDINANCE, 1913. |
| 21.6.29. | Government Notice No. 381 enforces the provisions of section 6 of the above Ordinance whereby occupiers of farms in the following area are called upon to contribute half the cost of burning a fire guard of not less than 45 feet along the common boundary :— That portion of the Hartley district bounded by and including the following farms :—Philiphaugh, Elston Extension, Bryn, Donnington, Alton, Dorton, Farnley, Malham, Beverley, Linden Park, Sandringham, Rock, Nyadgori, Serui Source, Glenluce, Garvillan, Idaho, Kent, Camarie, Daisy, Johannesburg, Clifford, John o' Groats, Tankatara, Lydiate and Elston. |

# Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

## AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 616. The Ground Nut or Monkey Nut, by C. Mainwaring.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.

No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson. M.C., Dip.Agric.
No. 684. Warning to Maize Growers: Maize for Export.
No. 685. Notes on Farm Practices at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Orrdinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.
No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.
No. 743. Sunn Hemp, by S. D. Timson, M.C., Dip.Agric.
Botanical Specimens for Identification.
Maize Grading Regulations.

## REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.
'o. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.
No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.
No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy. F.L.S.
No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.

No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.
No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.
No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.
No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.
No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.
No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H G. Mundy, F.L.S.
No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.
No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.
No. 564. A Maize Rotation Experiment, by A. R. Morkel.
No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.
No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.
No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.
No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.
No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.
No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.
No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.
No. 745. Salisbury Agricultural Experiment Station Annual Report, 1927-28, by H. C. Arnold.

## TOBACCO.

No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.
No. 607. Tobacco Seed Beds, by D. D. Brown.
No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.
No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.
No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.
No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.
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## Editorial.

*Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.*

**Down the "Street."**—Having managed to take a short respite from the responsibilities of office, we recently made acquaintance with the "Street." The "Street," it should be explained, runs in a direct line for some 40 or so miles in a north-westerly direction from Eldorado towards Sipolilo, and is the main thoroughfare of a group of farmers who have taken up land in that vicinity. The photograph reproduced on the opposite page is of the "Street" farmers and their wives, comprising the Ayrshire-Sipolilo Farmers' Association. Some of the farmers are soldier settlers who came out here after the war, and others are of longer residence. The whole comprises a splendid type of settler of whom any country would be proud and who, in spite of a setback caused by the slump in tobacco, are determined to make good. All these

farms are suitable for mixed farming, and with the tempor effacement of tobacco most of the occupants are turning tl attention to maize. By good farming and by reason favourable prices several of the "Street" farmers situa 40 miles from rail have found it possible to grow maize a profit, and have this season placed on rail at Eldorad considerable quantity of grain. But the growing of ma at this distance may not always be an economical propositi and these farmers, in common with others down the "Stree need another string to their bow. This they hope to find cotton, which is particularly suited to the soil and clima conditions of the area. Therefore at nearly each farm w to be seen plots of the new jassid-resistant U. 4 cotton, whi has been issued for seed propagation. Major Cameron, Cott Specialist, of the Empire Cotton Growing Corporation, w whom we had the pleasure of travelling on this trip, appear to be very pleased with the crops he saw, and there see to be good reason for hoping that in U. 4 we have a varie which will re-establish cotton in Southern Rhodesia. M of the "Street" farmers contemplate planting larger are of cotton next season, and we hope they will find in the cr a useful addition to the farm revenue.

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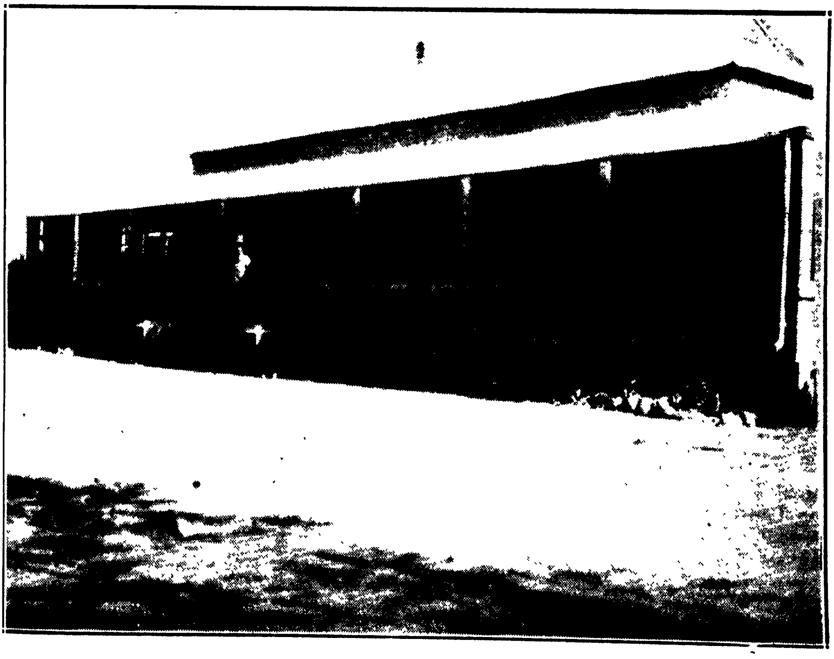
**The British Association in Rhodesia.**—A signal event the past month has been the presence in the Colony of mem bers of the British Association for the Advancement Science. The stay here of these illustrious men of scien was of brief duration, but they made full use of the limite time at their disposal to visit places of interest within eas access, and there is no doubt that they gained a considerab amount of knowledge regarding conditions in this remote pa of the Empire and the manner in which settlement is pro ceeding. Full opportunity was taken by the officers of th Department of Agriculture engaged in research to exchang opinions with the visitors and to obtain advice from thos well able to give it. In this way the visit of the Britis Association has been productive of much good, and the kindl encouragement given by them will be an inspiration to thos whose duty it is to further the development of the agricul tural industry in this Colony.

Homestead of Capt. and Mrs. James, Two Rivers Ranch.



Down the "Street."
Homestead of Mr. M. A. Graham, Mafuta.

Three popular lectures were given in Salisbury, two of which had to do with agricultural subjects, and the close attention accorded the speakers by the large and representative audiences was evidence of the value placed upon their remarks. It was distinctly encouraging to hear from Sir Daniel Hall and Sir Robert Greig that our problems are no more difficult of solution than those invariably associated with early settlement in other parts of the Empire. They were undoubtedly impressed with the possibilities for agricultural and pastoral development in Rhodesia, although, being cautious, neither would commit himself to any definite statement.

The visit of the British Association will long be remembered in Southern Rhodesia, and we are pleased to feel that our visitors will take away with them pleasant memories of their sojourn in our midst.

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**Plant Importation Regulations.**—Attention is directed to Government Notice No. 440 of the 26th July, whereby importation into Southern Rhodesia is prohibited of maize seed (*Zea mais*) from India, the Philippine Islands and the Dutch East Indies, or from any other country in which *Sclerospora* diseases of maize may be found to occur. Elm seeds and plants, including all species of *Ulmus* from Europe or from any other country where the elm disease (*Graphium ulmi*) is known to exist, are also prohibited, as well as chestnut seeds and plants, including all species of *Castenea* from North America or any other country where the disease known as chestnut blight (*Endothia parasitica*) occurs. The importation into Southern Rhodesia of tea seeds from India, Japan and Formosa is now prohibited, except under the authority of a special permit issued at the discretion of the Secretary, Department of Agriculture. Such consignments must be accompanied by a certificate, signed by a scientific officer of the Indian Tea Association, the Imperial Department of Agriculture of India or of the Department of Agriculture, Japan, certifying that the disease known as blister blight (*Exobasidium vexans*) does not exist or has not occurred within a radius of ten miles of the estate or garden on which the seeds were produced.

**World's Poultry Congress, 1930.**—We gather from the Journal of the Ministry of Agriculture that arrangements are well in hand for the congress to be held at the Crystal Palace in July of next year. Many applications have been received for space in the commercial and live stock section of the exhibition which is to be held concurrently with the congress, and it would appear that the Crystal Palace, with its extensive grounds, will be none too large for all the requirements of the congress.

It is stated that the international response has been very gratifying, and it is now certain that a very large number of nations, from Nicaragua to Norway, from Portugal to Peru, will be represented at the congress. It is expected that Canada and the United States will be powerfully represented, while France, Holland, Germany and Denmark will have exhibits worthy of their respective countries. The Irish Free State, South Africa and other Dominions and Colonies intend taking part, while there will be a very attractive symbolic display of poultry-keeping within the Empire staged by the Empire Marketing Board.

The national exhibit for Great Britain and Northern Ireland will be one of the features of the congress. Substantially it is to present in a popular form a tangible demonstration of the development of the home poultry industry, with special reference to the influence of the national schemes of education and research in Great Britain and Northern Ireland. In addition, marketing displays will be staged as an integral part of this national exhibit, which is being planned under the guidance of the Department of Overseas Trade.

An official tour is to be made after the congress, and it is intended shortly to publish particulars of the itinerary and the cost. The tour will provide an opportunity of seeing at small cost not only the chief features of the poultry industry of the United Kingdom, but a great many of the historical and beauty spots of the country.

Anyone who wishes to learn more about the congress should apply to the Secretary, World's Poultry Congress, 10, Whitehall Place, London, S.W. 1, for a free copy of the attractive illustrated brochure which was issued recently.

**Afforestation in Southern Rhodesia.**—We have from time to time drawn attention in this Journal to the manner in which the indigenous timbers of this Colony are being cut out for farming and mining purposes, and stressed the urgent necessity for afforestation to replace the wastage. We have also alluded previously to the large sum of money which we pay annually for timber and manufactures thereof purchased outside the Colony. These purchases, it may be mentioned, cost us in 1928 no less a sum than £381,071, most of which should be supplied locally. For instance, we paid £61,391 for sleepers, £42,671 for wooden frames for houses, £6,943 for hubs, rims, spokes, felloes, etc., and £2,149 for handles for picks, shovels and agricultural implements. Under the heading "Other Wooden Furniture" we spent £92,804, of which £78,799 went to the Union of South Africa. The Forest Officer has in his office specimens of locally grown exotic and indigenous timbers which are equal in every way to the imported article. The matter of seasoning is one that comes to mind in such a discussion, but it may here be stated that the officer who was sent to Pretoria to obtain first hand information of the methods employed there has returned with data which it is hoped to put to practical use shortly. These facts bring home to us the need there is for a campaign of afforestation in this Colony.

As regards world supplies, it is generally known that a universal shortage of soft woods is anticipated in the near future. Speaking at the Royal Empire Society's luncheon at the Cannon Street Hotel, London, recently, Sir Herbert Matthews, formerly Secretary of the Central Chamber of Agriculture, said that at the present rates of exploitation the virgin forests of Canada will be exhausted in twenty-five years. Summarising the present position, he said that the demands for pulpwood and timber for collieries, railways, building construction and various other purposes could not be met indefinitely from existing supplies; and all these demands were increasing. "A point that needs the strongest possible emphasis," said Sir Herbert, "is that while the Empire supply of hard woods is probably sufficient for our future needs, the supply of soft woods is rapidly disappearing." The United States of America was, he said, already drawing on Canadian supplies, and Europe was an importing Continent, mainly from Canada. Many of the forests in

Europe were to all intents and purposes inaccessible, whilst the output from Sweden was regulated and restricted. Great Britain imported about £100,000,000 worth of timber annually. Australia imported approximately half its timber requirements; New Zealand also depended on other parts of the world for a considerable portion of its timber and its timber product requirements. The only solution of the problem was in replacement.

The Government of this Colony, through its Forestry Officers, encourages the planting of trees, and State forests are being established at Mtao and Stapleford, where 2,000 acres of hard and soft woods have already been planted as part of a scheme of afforestation which will ultimately occupy 27,000 acres. The Arboricultural Association is helping in the good work, and we hope their efforts will receive the support from the farmers they deserve. The growing of trees for commercial purposes is of course governed by numerous considerations, such as suitability of soil and climate, correct choice of species for each locality and proper methods of planting and tending the trees; but we venture the opinion that where conditions are suitable, enterprise of this nature will richly reward those who undertake it on approved lines.

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**Agriculture in Nyasaland.**—The annual report of the Department of Agriculture for the year 1928 states that the total area under cultivation by Europeans in Nyasaland totalled 62,230 acres, of which 22,475 acres were under tobacco, 20,569 acres under miscellaneous crops (maize 4,812 acres, beans 3,818 acres, and timbers 10,964 acres), 7,596 acres under tea, 7,863 acres under fibres, 1,046 acres under cotton, and 1,281 acres under coffee. These figures reveal the fact that in the past ten years cotton has fallen from 18,141 acres to 1,046 acres, tea has risen from 4,433 to 7,596 acres, and fibres from 1,281 to 7,863 acres. Comparing 1928 and 1927, tobacco and cotton show reductions of 2,527 and 1,499 acres respectively, while tea and fibres show increases of 526 and 1,581 acres. In 1927 the European tobacco crop was the largest on record for Nyasaland as regards acreage, production and estimated value; in 1928 the area under cultivation fell to 22,475 acres from 25,002 acres, and the

production from 93,647 cwts. to 81,355 cwts. The exports (European and native) fell from 15,466,032 lbs. in 1927, valued at £780,964, to 11,632,497 lbs. in 1928, valued at £496,561. The average yield per acre on European estates in 1928 was 405 lbs.

The following reference is made to the tobacco situation in 1928: "Planters, in recognition of the stagnation of the Home market for Empire-grown brights, turned their attention mainly to the production of semi-brights and darks, and the quantity of brights exported was negligible as compared with the shipment of this class of tobacco during the previous year. The restricted planting of brights in Nyasaland. coupled with the reduction of the acreage in Southern Rhodesia, has not yet had any noticeable effect on the Home market, and it is keenly disappointing that much of the brights exported in 1927 still remain unsold. Market reports also show that darks, with the exception of wrappery tobacco of good quality, can only be sold with difficulty, unless the tobacco is sacrificed at prices that leave no profit or that entail a loss to the owner."

The number of natives registered as tobacco growers in 1928 was 34,761, and in 1927 66,321. Production in 1928 amounted to 2,414 tons, and in 1927 to 3,484 tons. In 1924 only 525 tons were produced by natives. As in previous years, the only crops grown by natives for export were tobacco and cotton, with the exception of a small quantity of ground nuts. In 1928 natives produced 37 per cent. of the tobacco crop of the country and 93 per cent. of the cotton, as compared with 12 per cent. and 24 per cent. respectively in 1918.

The live stock owned by Europeans at 31st December, 1928, was 21,037, of which 56 were pedigreed. At this date natives owned 126,221 head. Sheep owned by Europeans numbered 1,534, and by natives 104,328.

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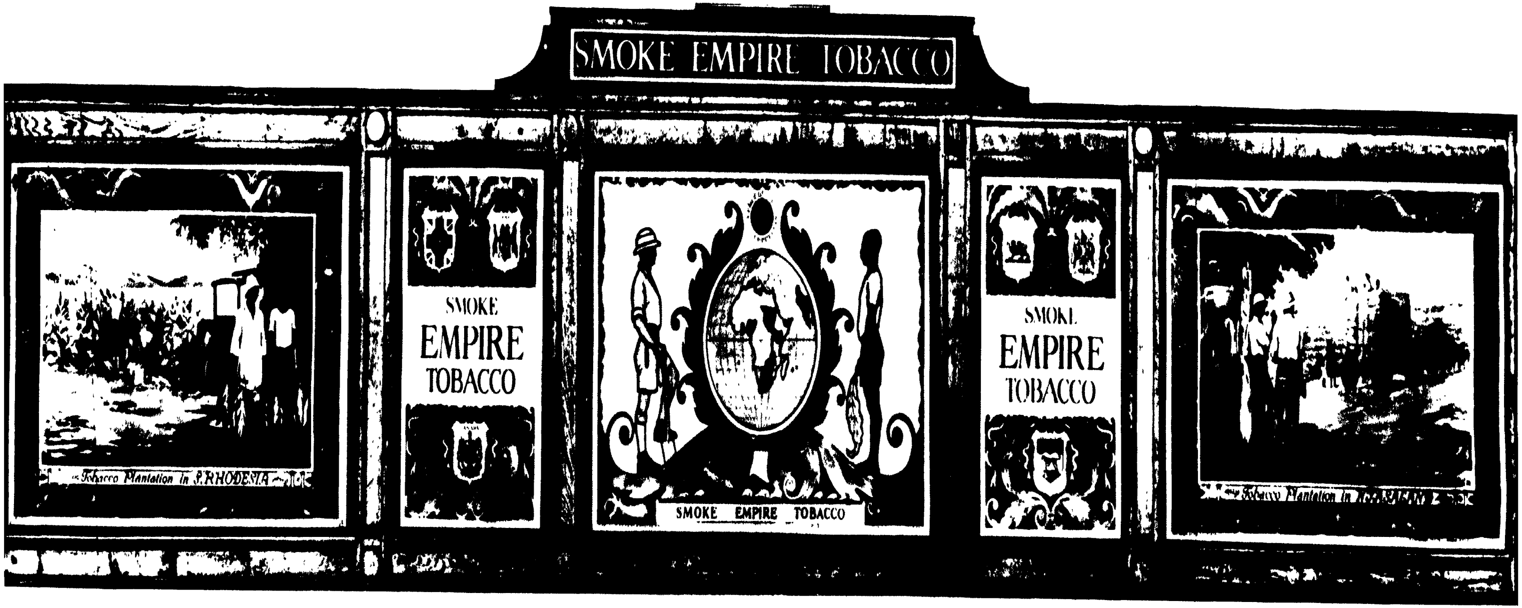
**The Empire Marketing Board.**—It has been our pleasing task from time to time to refer to the valuable work which the Empire Marketing Board is doing in furthering the marketing of Empire products in the United Kingdom and by grants for research to help in the solution of the many problems which confront the agriculturist in the Dominions

and Colonies. We have now received the third annual report of the Board, covering the period May, 1928, to May, 1929, which carries the story of the great Imperial work entrusted to this organisation a stage further. From what is written it is evident that the tide of Empire trade is flowing strongly. The Dominions and Colonies are able to supply more and more of the needs of the United Kingdom, and in return the United Kingdom is finding in the oversea Empire a growing demand for British goods. Already, with many of the Dominions and Colonies only on the threshold of their economic manhood, the oversea Empire, while it comprises only one-quarter of the world's surface and population, absorbs nearly half the exports of the United Kingdom.

Readers are aware of what the Empire Marketing Board has done and is doing to help in the disposal of our tobacco and citrus fruits in the United Kingdom. For this we are indeed grateful, and feel sure that with this powerful organisation behind us the difficulties encountered in marketing the former commodity will in course of time disappear. This, however, is not our only indebtedness to the Board. For instance, financial assistance to the extent of £2,500 for three years—to which a like sum is added by our Government—has been made available for the purpose of research on the mineral content of natural pastures, with special reference to certain deficiencies in the soil and their effect on the growth and strength of stock, while £2,280 for the first year and £2,000 for the second year have been granted towards the cost of transport of pedigree live stock from the United Kingdom to Southern Rhodesia. In this instance also the Government of this Colony is contributing a like sum. As readers are aware, the first consignment of one hundred head of cattle imported under this agreement have arrived in the Colony and have been distributed to their respective owners. An outline of the work planned on the first-named subject was given in our July issue. In this way we have direct evidence of the practical nature of the Board's work and of the desire of His Majesty's Government to assist in the development of this Colony.

Considering the work of the Board from a broader point of view, we see that eight new Imperial scientific bureaux, jointly financed by the Governments of the Empire, have now been established, while a Colonial Advisory Council of




This poster is being shown in all the principal cities and towns of the United Kingdom. The full length of the poster, which has been issued by the Empire Marketing Board, is over 20 feet

Agriculture and Animal Health has come into being. These institutions show how strongly the tide is flowing in favour of co-operation. Apropos of this the report states:—"Scientists and economists can between them offer four main contributions towards the furtherance of Empire marketing: First, they can help to develop to the full the at present barely tapped natural resources of the Empire. Secondly, they can help to render production as economical as possible by reducing waste in the field, in transit and in store. Thirdly, they can help to ensure that regularity of supply and uniformity of quality which are two essentials of progressive modern marketing. Lastly, they can provide knowledge, on the one hand, of crop prospects and general trade conditions in any producing industry, and on the other hand, of the special demands and preferences of the consuming public and of the traders through whom that public is reached. All the Board's expenditure on research and on economic investigation serves one or more of these ends."

It is interesting to note that a reproduction of one of the Board's contract posters, issued to factories in the United Kingdom, appears as a frontispiece to the report. This poster reads: "A contract for Southern Rhodesia is now in hand at these works. *Question*: How can you help to secure further contracts from Southern Rhodesia? *Answer*: By buying and by getting your wife to buy the produce Southern Rhodesia is sending us." In very bold type appear the words, "Buy Southern Rhodesia Tobacco, Cigarettes." Which helps to remind us to buy British goods on every possible occasion.

The report under review can be obtained from His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C. 2; price, 1s. net.

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**Britain's Food Supply.**—A comprehensive and valuable article entitled "The Key to Empire Trade," written by Mr. Harold T. Pooley, is a feature of the July issue of "Empire Production and Export," the official journal of the British Empire Producers' Organisation. It is shown that in 1928, of a total import of £1,184 millions, foodstuffs amounted to £532 millions (45 per cent.). Over the five-year period

1923-27 the Overseas Empire was responsible for 26.8 per cent. of all imports, but about 37 per cent. of the foodstuffs. The writer states that there is reason to believe that the figures for 1928, which are not yet fully available, will show a large increase. Of the amount of £532 millions spent by Britain in 1928 on imported foodstuffs, 109 millions were for meat (including animals), 57 millions for wheat, 52 millions for butter, 35.8 millions for tea, 17.8 millions for tobacco, 17.76 millions for eggs and 15 millions for cheese. Canada holds pride of place as a supplier of wheat, and of the 25 million quarters (480 lbs.) imported by Britain in the crop year 1927-28, provided 8.4 million quarters, the United States supplying 7 millions and Argentina 5.25 millions. Australia's quota amounted to 2.7 million quarters. In the same year the flour imported was four million sacks (280 lbs.), of which just under two millions came from Canada.

In 1927 Britain imported 673,000 tons of beef and supplied 819,000 tons herself. In referring to the possibility of supplies from Argentina being diverted to the United States, the writer states: "It is possible that, if the beef situation is not remedied from within the Empire, a number of consumers may go over from beef to mutton and lamb, particularly if prices are not too rigorous." In referring to Rhodesia as a potential source of supply of beef the writer states: "Rhodesia is a proved cattle country, but there is no ready access to the sea except under such conditions as repeat the Australian problem." It would appear that account has not been taken of the possibility of this Colony supplying cattle on the hoof, of which several trial shipments have been made during the past few years.

Foreign countries are gaining ground in the British market as regards dairy products. For the year 1922 the total percentage of Empire imports was 51.6, but this figure had fallen to 40.7 per cent. in 1926, rising slightly in 1928 to just under 42 per cent., whilst Denmark alone provided 36 per cent. of the total in that year. The value of this total import of dairy imports in 1928 was £52 millions, of which New Zealand provided £19.75 millions, Australia £13.2 millions and the Irish Free State £8.7 millions.

The following reference is made to tobacco: "The most astonishing result of the application of preference is probably

the growth of the share in the United Kingdom market taken by Empire tobaccos. In 1919, the year prior to the introduction of the present preferences, Britain's imports for home consumption from the Empire were 1.5 million lbs., forming 1.01 per cent. of the total clearances for home consumption. These figures have risen steadily, until in 1928 the Empire share was 26.6 million lbs., being 16.62 per cent. of the total. For the first quarter of 1929, Empire clearances were 18.2 per cent. of the total. Naturally it has not been a simple matter for the trade to absorb the whole of this astonishing increase, and the unexpectedly large extension of the Rhodesia crop has complicated the situation in the year past; but the process of digestion is going on steadily, and as long as a fair proportion of the preference is allowed to get through to the producer, and he is not beaten down to the point of abandoning production, even larger percentages may be expected in the coming years without danger of damming up the retail outlet. It is to be noted that in any comparison of industrial prosperity the tobacco manufacturers are very easily at the head of the list, whereas the grower in the Dominions and Colonies sits precariously at the present time on that knife edge which divides profit from loss, and in some Colonies is definitely down on the side of loss." It may be mentioned in passing that Sir Benjamin Morgan, the chairman of this organisation, was largely responsible for obtaining the preference granted in 1920 and for stabilising it in 1926 for a period of ten years from that date.

The writer has some very interesting remarks to make on the matter of marketing. "The distribution of food to the large and closely packed populations of the British Isles is an intricate and difficult matter. In some respects highly organised, it is also dependent largely upon traditional knowledge and rests on a mesh-work of trade relationships, both formal and informal. Attempts have been made by producers' bodies to come into this market and get their goods direct to the public, but without exception these have failed at some point or other. The function of the co-operative associations in regard to distribution, therefore, should be to use as fully as possible the ordinary legitimate channels of trade; but where they can exercise a very strong and decided influence is by studying the distributive machine carefully and

by refusing to use any part of it which is not absolutely necessary to the free flow of their goods to the consumer."

It may be useful to note here that the aims and objects of the British Empire Producers' Organisation are:—

1. To make the Empire self-supporting in all essential commodities, and give security and stability to Imperial industry.
2. To conserve, develop and maintain effective control of the resources and raw materials of the Empire.
3. To secure regularity of employment and better conditions of life.

**Visit of Renowned Meteorologist to Rhodesia.**—Sir Gilbert Walker, who for a period of 21 years was Director-General of Observations in India and is now Professor of Meteorology at the Imperial College of Science, London, recently visited Salisbury at the invitation of the Government in order to inspect the meteorological organisation in existence in this Colony and advise them as to its future development. He spent a period of four days in the Meteorological Office at the Department of Agriculture, and appeared gratified at the progress and state of development attained.

As Sir Gilbert Walker is the pioneer in long period weather forecasting from prior weather factors, his opinion as to the value of factors available for this country carries considerable weight. He stated that he considered it should be possible to issue a reliable forecast here in one year out of two as to the probability of an above or below normal season from an equation recently obtained. He intends to report at an early date on the various matters discussed during his visit, and further reference will be made to his conclusions after receipt of this report.

Some of Mr. C. C. Macarthur's slaughter oxen.

Mr. C. C. Macarthur's prize-winning slaughter oxen at the Salisbury Show, 1929. These oxen secured the special award of £20 and were afterwards sold for £20 each. The oxen were bred and fed by Mr. Macarthur at his farm Komani, near Salisbury.

# Cotton in Southern Rhodesia.

## HINTS TO GROWERS.

By G. S. CAMERON, Empire Cotton Growing Corporation.

The following notes are written with a view to explaining the position of the cotton growing industry in Southern Rhodesia, and the means whereby it is hoped the said industry may be revived.

Many farmers were bitterly disappointed over the failure of the cotton crop four years ago, especially as the cotton grown the previous year did so well. Not only were good yields obtained, but the prices then ruling were so high that even an indifferent cotton crop would have given a fair financial return.

Under those circumstances one can readily understand how it was that farmers set out to increase their cotton acreages the following year and how justifiably disappointed they were with the meagreness of their returns.

Looking back, however, it is now generally admitted that there was really very little likelihood of any crop ever becoming quite so easily established as it seemed would be the case with cotton. That its ultimate establishment will be realised there now seems but little doubt. On the other hand, there is still much need for caution before embarking on cotton growing on a large scale. In consequence of the work which has been carried out at the Cotton Breeding Station, Gatooma, combined with the results obtained on a number of widely scattered farms throughout Mazoe, Hartley and Lomagundi, it has been found that Mr. Parnell's strain of cotton known as U. 4 is likely to yield a fair return of seed cotton per acre where grown under suitable conditions.

To what extent Rhodesian conditions may be considered suitable can be judged from the results obtained this year on 68 farm-increase plots, which were grown for the double purpose of multiplying up seed rapidly and observing the behaviour of the strain on different farms. The actual yields per acre will not be available in time for publication with these notes, but in any case it would obviously be unfair to judge the results on a strict yield-per-acre basis alone, as the seed rate did not permit of as good stands being obtained as one could reasonably expect under commercial planting, where a much heavier seed rate would be employed.

Taking into account the way in which the plants grew, and more particularly their tendency to open their bolls properly, the writer is of opinion that about 56 out of 68 plots, or over 80 per cent., can be recorded as successful. If we eliminate about seven cases in which the crop was neglected, the percentage success is raised to over 90.

Very severe bollworm attack combined with poor stands after planting accounts for four of the plots or almost 6 per cent., while one plot failed to give a good return for some unknown reason. It might be due to unsuitable soil or subsoil conditions, but as this is not known definitely, surmise is useless.

If we take into consideration the unfavourable opening season, late planting rains and cold dull weather, the above-mentioned results must be considered at least satisfactory. Given a more favourable season, the outlook is distinctly promising.

It has therefore been decided to carry on with the distribution of U. 4 cotton seed for the ensuing season, and in this connection advertisements have been appearing in the Press to the effect that the Government is issuing U. 4 cotton seed to farmers who are desirous of giving it a trial. The price stated, 1½d. per lb. f.o.r. Salisbury, is considered reasonable for ordinary commercial planting seed. At the same time it will be observed that the seed is sold without guarantee. At this point it is well to warn the public against unscrupulous vendors of cotton seed who readily advertise their seed as "jassid-proof," "jassid-resistant," etc. The seed which is being sold by the Government this season gives a heavy yield under favourable conditions and possesses a

Field of U. 4 cotton at Silater Estate, Sipolilo district. One picking has been taken.

high degree of resistance to jassid, but in this respect farmers should realise that there remains room for improvement. That a steady improvement will be effected there is no reason to doubt. Further improved strains showing considerable promise of heavier yields—quality and ginning outturn—are now in process of being multiplied up as rapidly as conditions will permit on the Cotton Breeding Station, Gatooma.

For those who contemplate growing cotton this coming season it may be as well to outline a few of the outstanding points which require consideration:—

*Choice of Land.*—There seems to be an idea prevalent among farmers in Southern Rhodesia that cotton has to be grown on poor soil. This is far from being correct, but it is perhaps necessary to offer a word of explanation. In a wet year cotton will mature earlier on light soils than on heavy red loams. Such heavy red loams, when they have grown maize continuously for a number of years until the yield has ceased to be a paying proposition, should be put down to cotton for one season. As far as has been observed, cotton grows well on good average maize land.

Generally speaking, cotton can be grown on any soil that is well drained. If, therefore, we avoid vleis on the one hand and shallow soils with a clay sub-soil on the other, one can be moderately certain of getting a fair return of cotton.

One is frequently asked if cotton will grow well on sand veld. The obvious reply is that it all depends on the sand veld. There is such a large proportion of useless sand veld that it is necessary to observe great caution when advising people to grow cotton on it. Provided the sub-soil is well drained, the author has no hesitation in recommending that cotton be given a trial even on poor sandy soils. It is not suggested that they will give heavy yields, but on the principle that half a loaf is better than none at all, it is worth while trying out cotton on such soils. If eventually it is proved that a good class of sand veld will produce payable yields of cotton, it must be conceded that it is a crop which will make a vast difference to many farmers in this Colony.

*Fertilisers.*—Sufficient work has not yet been done in the way of fertiliser trials to justify a definite pronouncement as to the quantity which should be applied to cotton in order to give the best results.

On the assumption that soils in Southern Rhodesia are generally deficient in phosphates it has been customary to recommend an application of about 150 lbs. per acre of bone and superphosphate. As a result, however, of recent discussions with the Chief Chemist, Mr. A. D. Husband, to whom grateful acknowledgment is hereby made, it is suggested that about 50 lbs. of muriate of potash plus 100 lbs. of bone and superphosphate per acre ought to be a more suitable dressing.

Whether this should be applied in the row or broadcast depends on which method the grower finds most convenient. In the writer's opinion there is not sufficient evidence to justify sweeping statements to be made claiming either method as being superior to the other.

*Time of Planting.*—The earlier the cotton is planted the better. This is a matter over which the farmer can exercise only limited control, as he is entirely at the mercy of the season, but the same applies to most crops. Cotton planted in the end of October or early in November stands a fair chance of maturing even at higher altitudes than was formerly supposed. Again it all depends on the season. The writer has frequently been told that the cotton planted in January, 1924, did just as well as cotton planted in November and December of the previous year. That may well be the case, but most people admit that the season under reference was truly an exceptional one. We are not concerned with exceptions, and therefore repeat that, year in year out, the earlier the cotton is planted the better.

*Spacing.*—The best spacing to be adopted in the row and the distance between rows will never be satisfactorily solved, as they will differ from farm to farm and from season to season. The wider the plants are spaced within reason the larger will they become, and they will give a heavier yield *per plant.* What we are all after, however, is the spacing which will give good yields per acre. This the individual grower will have to find out for himself over a number of years. As a rough guide it is safe to say that

the distance between rows should be about 3½ feet (42 inches). It is not easy to lay down even a rough indication as to spacing in the row. Last year we recommended a wide spacing, namely, 3 feet by 3 feet, in order to obtain a good return of seed per plant. This year we recommend a much closer spacing in the row and suggest 18 inches. At the same time every grower should try out a part of his cotton crop at a much closer spacing—say, 10 inches to 12 inches. Close spacing is said to hasten maturity, and though the individual yield per plant will not be so great nor the crop perhaps look quite so spectacular, the yield per acre should be greater.

*Hand* versus *Machine Planting*.—Considerable difference of opinion exists regarding the best method of planting cotton seed. For large acreages there is no doubt that machine-planting covers the ground much more quickly than planting by hand. The latter, however, makes the better job and the writer recommends it to be used up to about 50 acres.

When planting by machine it should be set so as to plant very shallow. It is not too shallow even if an occasional seed is left above ground.

When planting by hand the rows can be marked out by setting the wheels of a maize planter at the correct distance apart, viz., 3½ feet, while natives plant the seed in the row. They should place about four seeds per hill at a depth of not more than half an inch, and cover them over lightly with loose soil. This method should give a good germination even when hard crust formation takes place. Germination should commence in about four days and be complete in ten days' time if soil moisture conditions have been suitable.

If cotton is planted on the first rains they should total about half an inch, otherwise the seed may germinate but not have sufficient moisture to carry them on in the event of a continuous dry period.

*Dry Planting* is advocated by a number of farmers, and the practice may be justified where large acreages are grown, but there is always the danger of the seed germinating on a light rainfall and the seedlings dying through insufficient moisture to keep them alive.

*Thinning*.—When the young cotton plants are about 6 to 8 inches high they should be thinned out so as to leave

one or not more than two plants per hill. Hitherto it has been the practice in Southern Rhodesia to thin out to one plant per hill, and this may be quite sound practice where the plants are spaced close together. As the distance advocated in these notes is 18 inches, it is felt that it might be better to leave two plants per hill.

*Cultivation.*—The oftener cotton can be cultivated in the early stages the better. As soon as the young seedlings are through the ground so that the rows are distinctly visible they should receive their first cultivation. This first cultivation should be deep. Subsequent cultivations should not exceed a depth of 3 inches in order to avoid damaging the roots of the young plants. The number of times cotton should be cultivated will depend on the amount of weeds in the crop. As a rule the cultivator should go through four to six times, in addition to which it is necessary to hand-hoe between plants.

*Hand Weeding.*—After the first or second cultivation the cotton should be weeded by hand. This can be done to advantage at the same time as the thinning operation.

If weeds persist it would be better to abandon part of the crop and concentrate only on as much as can be kept clean. It is useless to expect a good yield of cotton if the crop is choked with weeds.

*Picking.*—In an ordinary year cotton should be ready for picking in about 5½ to 6 months from date of planting. There is no hard and fast rule as to when cotton should be reaped, but it is well to remember that the longer the cotton is left on the plant, within limits, the easier it will be for the labourers to bring in a fair amount of seed cotton per day. It is difficult to define what constitutes a fair amount of seed cotton for a boy to pick. At present the native labour of the country is not sufficiently experienced in picking cotton to be able to gather a large daily amount. On a good, well-opened field of cotton an experienced picker will bring in as much as 100 lbs. of seed cotton per day. To begin with it would be better to set a much lower standard in this country until natives become accustomed to the work, and growers should be satisfied with 40 to 60 lbs. per picker on a good crop.

The writer has heard statements to the effect that it will not be possible to pick cotton economically in Southern Rhodesia owing to scarcity of labour. Such should only be the

case where individuals endeavour to grow acreages of cotton beyond their resources. At the same time it should be recognised that a large source of labour for picking cotton remains untapped in the population of native women and children. If cotton picking can be made popular among them there is no reason why they should not prove better at this class of work than the men. The climate during the cotton picking season, combined with the light nature of the operation, is such that no more congenial employment could be found. It may be necessary to exercise great patience in training them, but success in this direction should prove of mutual benefit to themselves and the growers.

*Sorting.*—Pickers should be gradually trained to pick only the white unstained cotton in the field. Stained and dirty cotton should be left on the plant until the end of the season, when a final clean-up of all the cotton in the field can be made.

Even in the best fields, however, there will always be a certain amount of stained cotton, and this should be picked out when baling the seed cotton for despatch to the ginnery.

Too much time should not be wasted on this operation, as there ought not to be much stained cotton to be sorted out if the pickers have been trained to do their job properly.

## SUMMARY.

1. Select good, well-drained soil. If it is rich land suitable for growing heavy yields of maize, grow maize. Avoid vlei and land with clay sub-soils.

2. Have land in good tilth before planting. Plant in rows as straight as possible. By so doing, subsequent cultivation is facilitated.

3. Plant four seeds per hill to make sure of good germination.

4. Do not forget to thin out to not more than two plants per hill.

5. Cultivate early and sufficiently often to keep weeds in check.

6. Do not plant more than you can look after properly.

7. If short of labour, do not plant at all.

8. Wait till half the bolls on the plant are fully opened before commencing to pick.

9. Train your labour to pick only good, clean cotton.

10. Mark your woolpacks distinctly when sending to the ginnery.

# The Sweet Potato.

## (*IPOMŒA BATATAS.*)

By S. D. Timson, M.C., Dip.Agric.(Wye).

(Published with the approval of the Chief Agriculturist.)

The sweet potato, which is a perennial plant, though normally cultivated as an annual, belongs to the very large and widely distributed natural order of plants called *Convolvulaceæ*. There are some fifteen known species of the genus *Ipomœa*, all of which are found in America, and four only in Asia.

The country of origin of the sweet potato is uncertain, some authorities favouring America and some China, but the former is generally recognised as the more probable, chiefly owing to the fact that all the fifteen known species of *Ipomœa* are found in America.

The plant is a trailing vine, which strikes roots at the joints and bears leaves of varying shape according to the variety. The length of the vine also varies greatly with the different varieties, some having long stems, whilst others follow a bushy habit of growth.

The tint, shape, hairiness and venation of the leaves also vary greatly in the different varieties, and afford a means of identification. The sweet potato itself as commonly known is botanically a swollen, fleshy root, though it is usually referred to as a "tuber." There is great variation in the size and shape, and also in the colour of both the skin and the flesh, of the tubers of different varieties.

The following key to some of the strains more commonly grown in Rhodesia has been worked out by Mr. Walters, of the Department of Agriculture.

(a) Varieties with entire leaves—

(1) Tubers red and long; flesh white; early in maturity; stem hairy—Early Red.

(2) Tubers brown or yellowish; flesh white; medium late in maturity; very prolific in stem and leaf growth; and highly resistant to drought—Calabash.

(b) Varieties with 3-lobed leaves (ivy leaf)—

(3) Tubers yellow; flesh yellow; stem slightly hairy; early in maturity; more susceptible to drought than any other variety—Early Butter.

(4) Tubers pink; flesh white; stem quite free of hairs; medium early in maturity—Common Pink.

(c) Leaves deeply cut into 5 or more lobes—

(5) Tubers red and roundish; flesh white; stem very hairy; highly resistant to drought—Red Nansemond.

(6) Tubers white; flesh white; stems very hairy; lobes of leaves long and narrow—Common White.

(7) Tubers white; flesh white; stems slightly hairy; lobes of leaves broad; highly drought-resistant—Native.

The sweet potato crop is rapidly growing in popularity in this Colony, owing to its more extensive use in the dairying and pig-raising industries. Nevertheless the acreage under this crop is still only small and might with advantage be largely extended.

During the season 1926-27 the area planted to this crop was 601 acres, and the average yield per acre was 12 bags of 120 lbs. weight. This is the lowest average yield per acre recorded since 1921-22, and it is not fair evidence of the possibilities of the crop in Rhodesia. Yields of 5 to 7 tons of tubers per acre are easily obtainable on suitable soils, and when the crop is reasonably well treated.

**Uses of the Sweet Potato.**—The tubers form an excellent substitute for ordinary potatoes as a table vegetable, and in many of the warmer countries of the world they are used for this purpose almost to the exclusion of Irish potatoes. They

are also used as a commercial source of starch, but not to the extent they might be. The starch is said to be ideal for laundry work, and also for sizing yarns, filling cloth and thickening colours in cotton mills. The pulp, which is the bye-product of sweet potato starch manufacture, can be used as a feed for stock or for alcohol manufacture. The tubers themselves are also a potential source of alcohol.

It is, however, as a succulent stock feed for use during the dry winter months that in this Colony the sweet potato is chiefly valuable, and for this purpose it should be grown on every farm where stock are kept. The leafy stems form excellent green fodder for stock as the veld grass dries off, and up to the time of the first heavy frosts. They can also be converted into hay with moderate success or into silage.

When the whole crop is ensiled, the tubers should first be sliced into fairly thin slices by putting them through an ensilage cutter or ordinary root slicer. The following comparative analyses of sweet potato silage and maize silage are interesting. The former was made by the Florida Experiment Station and the latter by the Chemical Division of this Department.

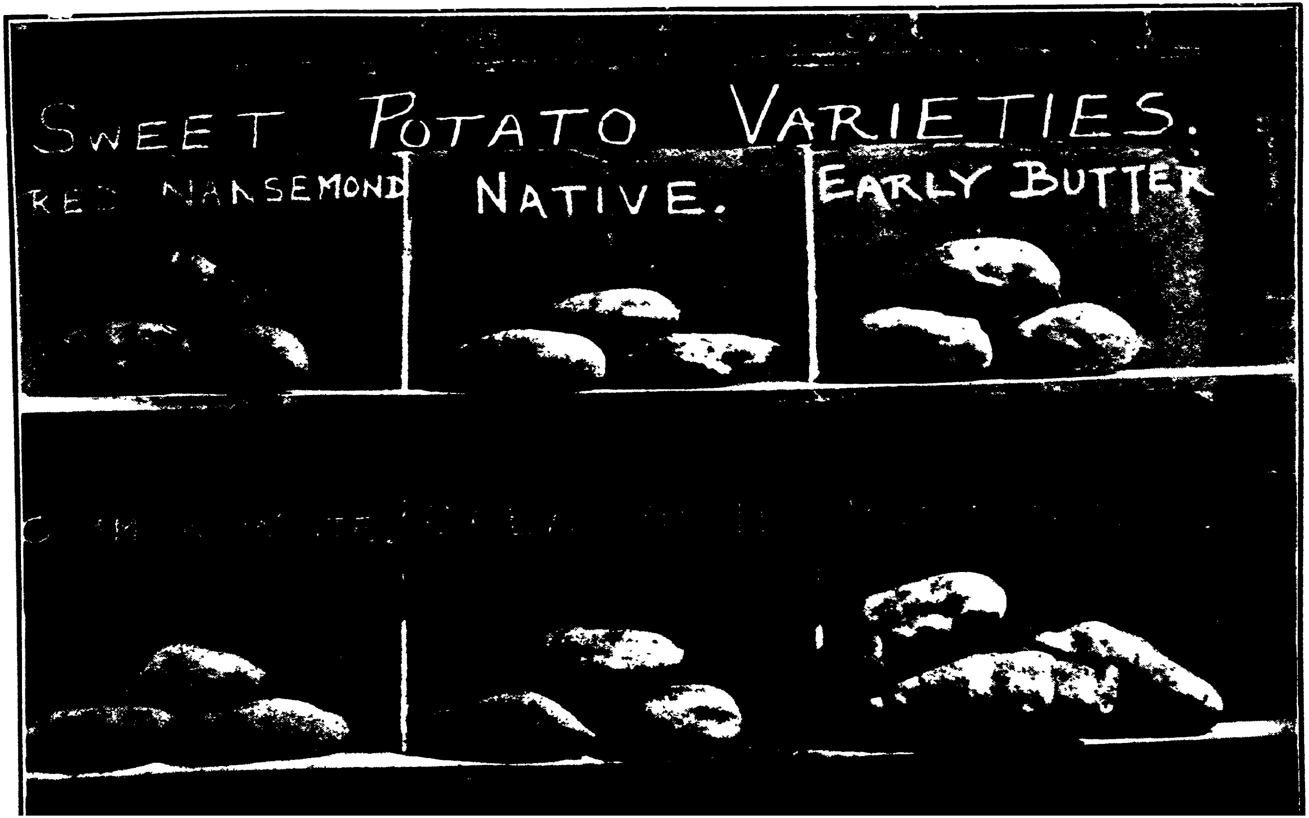
| | Water. | Crude protein. | Nitrogen free extract. | Fibre. | Fat. | Ash. | Nutritive ratio. |
|---|---|---|---|---|---|---|---|
| Sweet potato silage roots and tops | 54.87 | 1.82 | 39.41 | 1.48 | 0.66 | 1.85 | 1 : 22 |
| Maize silage (Rhodesian) | 75.8 | 2.0 | 14.9 | 5.0 | 0.4 | 1.9 | 1 : 8 |

Sweet potato tops alone make very palatable silage, and the following analysis made by the Chemical Division of this Department gives its composition:—

| | Water. | Fat. | Crude protein. | Carbohydrates. Soluble. | Fibre. | Ash. |
|---|---|---|---|---|---|---|
| Sweet potato top silage | 82.7 | 0.8 | 2.8 | 8.9 | 2.7 | 2.1 |

The tops may also be converted into a palatable and nutritious hay, as indicated by the following analysis quoted by Keith:—

| | | | Carbohydrates. | |
|---|---|---|---|---|
| Water-free. | Fat. | Crude protein. | Nitrogen free extract. | Fibre. |
| Sweet potato hay ... | 4.86 | 12.48 | 55.71 | 18.22 |
| Cowpea hay ... | 2.46 | 18.59 | 48.14 | 22.5 |


SWEET POTATO VARIETIES.
RED NANSEMOND
NATIVE.
EARLY BUTTER

Although the protein content of cowpea hay is over 5 per cent. greater than that in sweet potato hay, the fat and carbohydrates are very much in favour of the latter. The fibre, too, is much lower in the sweet potato hay, which is a decided advantage, as less energy is wasted in digesting it. The yield of hay per acre is, however, light, owing to the very high percentage of moisture in the vines and the crop is not easy to cure into hay.

Green sweet potato tops have an analysis as follows:—

| | Water. | Fat. | Crude protein. | Carbohydrates. Starch and sugar. | Fibre. | Ash. |
|---|---|---|---|---|---|---|
| Green sweet potato tops ... | 83.0 | 0.8 | 2.1 | 9.5 | 3.1 | 1.5 |

It will be seen that this analysis is practically identical with that of silage made from the green sweet potato tops.

The tubers have been analysed by the Department of Agriculture of the Union of South Africa, with the following result, which is compared with the analysis of Irish potatoes.

| | Water. | Fat. | Crude protein. | Carbohydrates. Soluble. | Fibre. | Ash. |
|---|---|---|---|---|---|---|
| Sweet potato tubers | 70.4 | 0.9 | 2.0 | 24.3 | 1.3 | 1.1 |
| Irish potatoes ... | 76.3 | 0.1 | 2.2 | 19.8 | 0.3 | 1.3 |

The tuberous roots of the sweet potato are a very valuable succulent feed for cattle, pigs and sheep. If left in the ground they will keep well all through the winter in Rhodesia, but they should only be lifted in such quantity at one time as may be consumed within a week or ten days, as they soon become diseased and rot. If sweet potatoes are fed to cattle as the only succulent in the ration, up to 20 lbs. or 25 lbs. per head per day, they may be fed in two or more feeds.

A suitable balanced ration for a growing fattening steer of 900 lbs. weight, including sweet potatoes and maize silage as succulent feed, is as follows:—

8 lbs. dolichos bean hay,
18 lbs. maize silage,
10 lbs. sweet potatoes,
3 lbs. maize meal,
2½ lbs. velvet bean seed meal,
with veld hay *ad lib.* in addition.

The tubers should be sliced or pulped before feeding to cattle.

Sweet potatoes are especially suitable for feeding to pigs, and are largely used for this purpose in America. It is said that an acre of sweet potatoes should feed eight to ten pigs, weighing 200 lbs., for a period of two months, provided the ration is balanced with adequate concentrated feeds. One of the best ways of feeding to pigs is to allow the animals to harvest the tubers for themselves by rooting them out of the ground, and thus saving the labour of lifting. Although pigs eat the tubers after they have become sour without any apparent ill results, they should never be fed to any other stock in this condition.

It is of interest to note that a mixture, in the proportion of 10 lbs. of sweet potatoes to ¾ lb. ground nut cake, gives a nutritive ratio of approximately 1: 6.5, suitable for fattening cattle or pigs, and also for a cow giving 11 lbs. of milk per day.

Sweet potato silage has been found to be valuable for feeding to milk cows, and experience in America has shown that it is 50 to 100 per cent. more valuable than maize silage for feeding purposes. Where a farmer wishes to clear his land of the crop quickly and has no facilities for storage of the tubers, it may prove convenient to turn the whole crop into silage. In this case the vines should be cut and wilted in the field for a few days before ensiling to dissipate some of the excessive moisture or, alternatively, the fresh vine can be mixed with fodder rather too dry to ensile by itself, in order that the latter may absorb some of the excess moisture.

In Rhodesia the green tops are best fed in the green condition in autumn after the rains have ceased, when the veld grasses have dried off and other green feed is running short, but it should be borne in mind that the first frost will kill off the foliage of the plants. Care should be used in feeding them to cattle, as too large a ration may cause "hoven" or "scouring."

**Soil Requirements and Manuring.**—The crop will grow on all soils which are not definitely infertile, providing they do not become water-logged, but the best soil is a fertile

sandy loam. The light red sandy loams utilised for tobacco in this Colony serve excellently, and good yields are also obtained on the heavier red clay loams. The crop may also be grown on almost pure sands, providing humus is supplied in the form of farmyard manure or by ploughing under a green manure crop such as Sunn hemp or cowpeas, to which a dressing of 150 lbs. per acre of rock phosphate or other phosphatic fertiliser may be given with advantage.

Except when grown on these very light soils, the crop should not follow immediately after the ploughing under of a green manure crop, since excess of nitrogen tends to produce undue top growth at the expense of the tubers, which are apt to become coarse and of bad shape. If it is necessary or advisable to apply fertilisers direct to the crop, usually potash fertilisers will be most needed, owing to the heavy ratio of carbohydrates which the plant has to produce.

In America sulphate of potash is said to be the best form of potash to apply, a normal dressing being between 75 to 100 lbs. per acre. Alternatively wood ash may be used applied at the rate of about 1,000 lbs. per acre. In Rhodesia a dressing of 150 lbs. per acre of superphosphate or bone and superphosphate may also be given. The crop needs a good supply of organic matter in the soil to produce good yields, and it cannot be expected to give satisfactory results on exhausted maize lands or on any soil where there is a marked deficiency of humus. When grown for stock feed—its present principal use in this Colony—the crop will probably not usually be directly manured or fertilised, but it should be allotted to land which, by reason of its previous treatment, is still in a moderately high state of fertility.

**Preparation of the Land.**—To obtain the best results, the land should be deeply ploughed in early autumn, and less deeply cross ploughed in early spring. The cross ploughing may be omitted if the first ploughing has been thorough, and the soil is in good mellow condition. The field should then be well pulverised by harrowing both ways with disc or drag harrow. If the crop is to be planted on the ridge, the land is finally thrown up into ridges with a ridging plough. Ridging does not appear to increase the yield in Rhodesia, as is shown in a table of experimental results given later in this article, but the lifting of the crop is undoubtedly

rendered easier, especially on the heavier soils. Ridging is not recommended on free working sandy soils, but on shallow sands, or those soils which compact very firmly after rains, the loose soil of the ridge permits of the easy swelling of the roots.

**Propagation and Planting.**—The crop is grown from cuttings taken from the runners, from tubers, or from rooted shoots. In this Colony the most convenient and best method would appear to be the use of the cuttings obtained from "volunteers" of the previous season's crop, or from slips obtained from tubers sprouted in a nursery bed laid down for the purpose. Where the crop is regularly grown on the farm, the former method of obtaining cuttings is usually employed, or a portion of the previous crop may be left untouched in the ground to produce cuttings for planting the new crop.

Tubers left in the ground over winter send out shoots early before the spring rains, and an ample supply of cuttings is usually available when the planting season arrives. Even if the tubers have been lifted, sufficient small and broken sections of root are usually unavoidably left in the land to give rise in spring to a volunteer crop of vines from which cuttings can be obtained.

Cuttings for planting should be about 8 to 12 inches long. The lower leaves are stripped off and the cutting is usually placed horizontally in a shallow furrow about 3 to 4 inches deep, and covered over with soil, a few inches of the stem carrying three or four leaves being left protruding from the ground. The cuttings should always be planted out in moist soil and preferably when more rain can be expected. It is best to take them just before they are required for use, since they rapidly dry out or rot with exposure or if placed in heaps or sacks. When cuttings are to be obtained from a nursery of tubers, specially laid down for the purpose, the bed can best be situated in a piece of moist vlei or in a patch of irrigated land. The tubers are placed in rows, close together but not touching one another, and are then covered with 2 to 3 inches of soil. Small tubers may be used for this purpose, and if large tubers are used they should be cut lengthwise and placed with the cut surface downwards. The tubers should not be planted until within a

fortnight or three weeks of the date when all reasonable fear of frost is past. One bag of tubers should produce sufficient "sets" to plant one acre of land. To avoid disease, the same bed or the material from it should never be used the following year. The sets or short shoots are broken off from the tubers by a sideways pull when they are about 4 to 5 inches high, and another crop of sets forms in their place. Three or four such crops of sets are usually obtained.

**Planting out the Cuttings or Sets.**—The crop requires as long a growing season as can be given it in this Colony to produce its heaviest yield, and so the cuttings should be planted out in the field as early as possible in the spring.

A method of growing the crop in areas of light rainfall or where rains commence late in the year has been tested at the Agricultural Experiment Station, Salisbury, and the following extract from the 1925-26 report of the manager of the station may well be quoted here in full:—"The heaviest yields of sweet potatoes are obtained when the climatic conditions are favourable for their growth and continue over a period of several months. In areas where the rains are liable to be late in commencing, it is often not possible to set the sweet potato slips out sufficiently early to secure a good return of tubers the same season. Under such conditions, planting the slips under the maize crop in January or February with the intention of lifting the tubers fifteen to eighteen months later has been recommended. Trials conducted last year showed that the small growth made by the sweet potatoes during the first season, prior to the advent of frost, did not reduce the yields of maize, and there seems no objection to the practice on that account.

"Trials made here this year on duplicate plots show that while the crop of vines was practically the same in both cases, the yield of tubers from February planting was three times as heavy as that of the slips planted in the following December."

Average Yield of Two Plots.

| | Tubers, lbs. per acre. | Vines, lbs. per acre. |
|---|---|---|
| Slips planted under maize— | | |
| 4th February, 1925 ... ... | 23,520 | 17,103 |
| 21st December, 1925 ... | 7,572 | 17,504 |

Planting out should never be done, however, except in moist soil, after good rains have fallen and when more may be looked for. The cuttings are usually spaced in rows 36 to 40 inches apart, with 12 to 18 inches between each plant. The soil should be well firmed round each cutting after planting. One maize bag should hold about eight hundred to a thousand cuttings, and from nine to ten bags of cuttings are required to plant an acre of land.

**After Cultivation.**—Cultivation after the cuttings have become established should be done as for a maize crop to kill weeds and establish a soil mulch to conserve moisture. Where planted on the flat one or two light ridgings may usually be given with advantage, and particularly if the soil shows any tendency to become water-logged. As the vines cover the land between the rows further cultivation will cease, but usually one or two hand hoeings will be found necessary.

**Harvesting.**—Owing to the long dry winter season the farmer can safely leave the tubers in the ground until they are required for use. In America, where this is not possible, various designs of storage houses have been developed where the tubers may be stored with very little loss, but the capital outlay required is only justified when the tubers are grown for table use, as they very largely are in that country.

The tubers are usually ploughed out and gathered by hand in this Colony. Even though the lifting is most carefully done, a number of pieces of tuber are invariably left in the soil to give rise to a considerable "volunteer" crop for several seasons unless steps are taken to eradicate them. This volunteer crop is often cleaned from the land with some difficulty, and when cuttings for the following year's planting are not required from the land it may be found desirable to turn pigs on after the crop has been lifted to rout up the remainder of the tubers. Where the crop is planted on the ridge, lifting is rendered very much easier, and this system seems advisable on the heavier types of soil.

**Seed Selection.**—Seed selection of tubers by individual "hills" at harvesting time should go far to produce higher yielding, disease-free strains of sweet potatoes. In Rhodesia little or nothing has yet been done in the way of improving the best strains by selection, but there is little doubt that much could be done in this manner to improve the yields per acre.

For seed selection purposes the best looking portion of the crop should be left in the ground until September, when the tubers should be lifted and examined "hill" by "hill." Those "hills" or plants having the largest number of well shaped, good sized tubers, which are free from any signs of disease, should be set aside to serve as seed for the propagation plot.

All the most serious diseases of the sweet potato in America are carried over from season to season on the "seed" tubers, and though these troubles are not yet apparent in this Colony, we should be on our guard against them.

**Yields.**—The crop requires so little attention that it is usually much neglected by growers in this Colony, and for this reason the average yield per acre of tubers is very low. However, under proper conditions, and when proper attention is given to its cultivation, yields of 7 tons per acre and over are easily obtained, and yields as high as 12½ tons per acre have been recorded.

The following table gives the results of variety trials carried out on the Agricultural Experiment Station, Salisbury, over a period of six years. Many varieties other than those given have been tested, but they have been discarded owing to unsatisfactory characteristics disclosed.

### Sweet Potato Variety Trials.

*Yields in lbs. per acre.*

| Name of variety. | Average weight of tubers over six years' trials. | Average weight of green tops. |
|---|---|---|
| Common Pink ... ... ... | 17,870 | 12,436 |
| Early Butter ... ... ... | 18,113 | 15,213 |
| Calabash Leaf ... ... ... | 13,776 | 17,408 |
| Red Nansemond ... ... ... | 12,094 | 16,091 |
| | over 3 years | |
| Linslade ... ... ... ... ... | 16,338 | 17,763 |
| | over 2 years | |
| Oklahoma ... ... ... ... | 11,344 | 18,660 |

The date of planting has a marked effect on the yield obtained, as is well demonstrated in the following results obtained at the Salisbury Station:—

*Date of Planting Trials.*

| Variety. | Date planted. | Weight of vines per acre. | Weight of tubers per acre. |
|---|---|---|---|
| Calabash ... ... | 23rd Dec. | 20,700 lbs. | 14,443 lbs. |
| Common Pink ... | 23rd Dec. | 11,600 lbs. | 25,036 lbs. |
| Calabash ... ... | 12th Jan. | 10,600 lbs. | 8,416 lbs. |
| Common Pink ... | 12th Jan. | 3,260 lbs. | 13,272 lbs. |

It will be seen that the earlier planted crop gave a very much heavier return, both of tubers and green tops.

It has been demonstrated by experiments carried out on the same station, of which the results are tabulated below, that, apart from the greater ease of lifting the tubers, no advantage is obtained by planting the cuttings on the ridge.

*Yields of Tubers in lbs. per acre.*

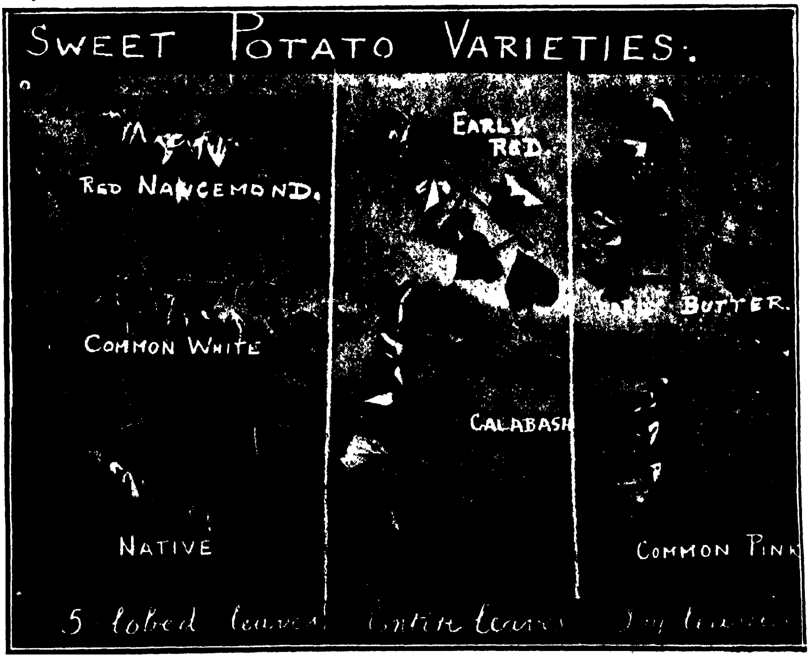
| | Grown on flat. | | Grown on ridge. | |
|---|---|---|---|---|
| Variety. | Vines removed 28th April, 1923. | Vines removed 16th July, 1923. | Vines removed 28th April, 1923. | Vines removed 16th July, 1923. |
| Red Nansemond ... | 7,392 | 11,808 | 6,480 | 14,400 |
| Early Butter ... ... | 16,896 | 18,768 | 15,900 | 15,480 |
| Common White ... ... | 6,048 | 11,472 | 6,840 | 10,620 |
| Common Pink ... ... | 13,872 | 21,504 | 7,500 | 21,480 |
| Calabash Leaf ... ... | 11,088 | 13,632 | 10,740 | 14,700 |

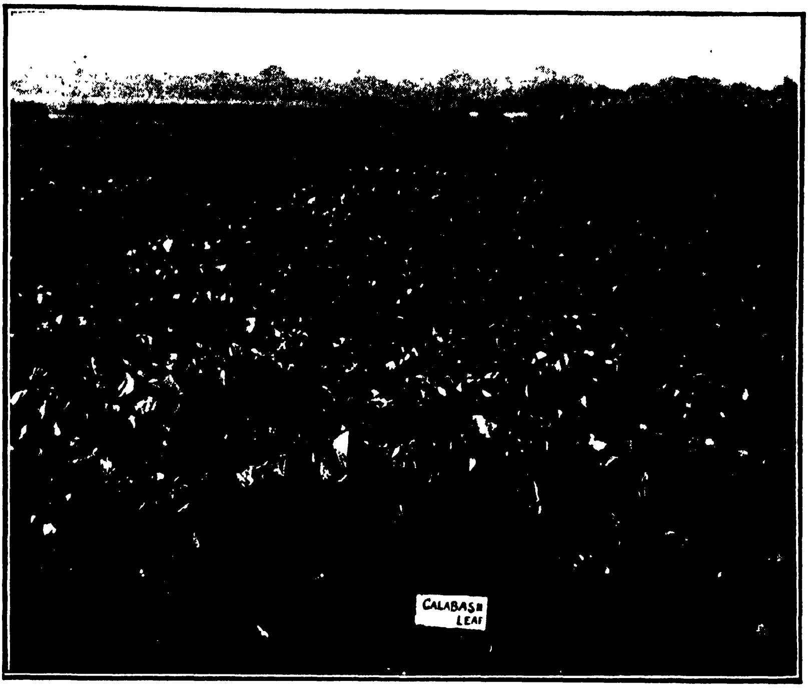
The above results further demonstrate that removing the green vines from the crop at the end of April appreciably lowers the yield of tubers, except in the case of the early maturing variety called Early Butter.

Although "volunteer" crops from the unlifted residue of tubers of the previous season's crop are not so good in either quality or quantity, it would appear profitable often to leave a "volunteer" crop to mature, as thereby the expense of preparation of the land is not incurred.

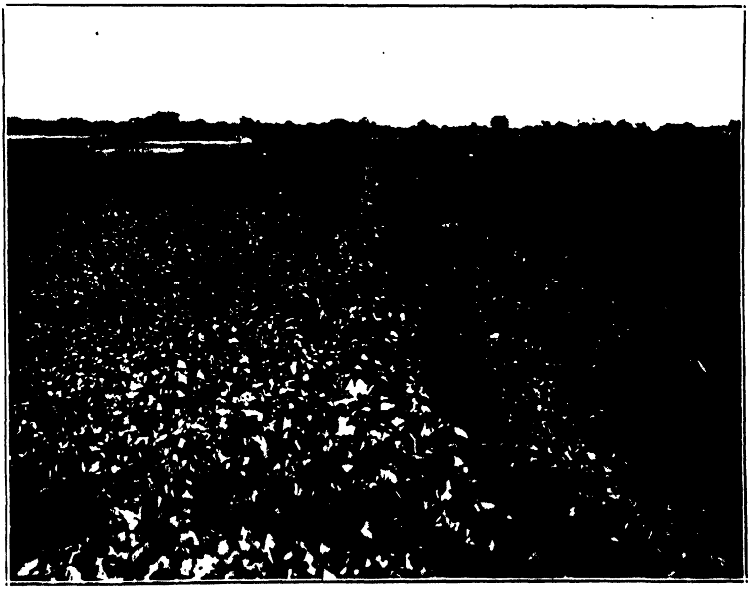
Trials carried out at the Agricultural Experiment Station, Salisbury, to test this point gave the results tabulated below:—

Cannas and sweet potatoes planted in alternate rows to test their relative merits as producers of succulent feed. Agricultural Experiment Station, Salisbury.






The Calabash sweet potato, showing the heavy growth of vine and foliage. Agricultural Experiment Station, Salisbury.



On left, sweet potatoes (Calabash) from tubers left in ground over dry season. On right, planted from cuttings taken from crop on left.

*Yields of Tubers in lbs. per acre.*

| Variety. | 1st year's crop, 1926-27. | Volunteer crop, 1927-28. | 1st year's crop, 1925-26. | Volunteer crop, 1926-27. | Volunteer crop, 1925-26. | Average 3 years' volunteer crops. |
|---|---|---|---|---|---|---|
| Common Pink ... | 14,040 | 11,519 | 16,524 | 4,334 | 14,166 | 10,006 |
| Early Butter ... | 16,623 | 14,365 | 14,130 | 3,850 | 16,488 | 11,569 |
| Calabash Leaf ... | 10,269 | 9,180 | 11,640 | 3,410 | 4,392 | 5,660 |
| Red Nansemond | 12,789 | 9,945 | 11,664 | 3,454 | 6,225 | 6,542 |
| Linslade ... | 12,440 | 14,076 | 16,215 | 3,542 | ... | . |
| Average all varieties | 13,232 | 11,817 | 14.040 | 3,718 | ... | ... |

As will be seen in the table, the yields of the second crop usually compare well with the yields of the first crop. The reason for the low yield in 1926-27 of the second crop was probably that the land was reduced in fertility considerably by the heavy first crop grown, and in this condition of the soil the plants were unduly affected by the short rainfall in that year. When a heavy return of vines and tubers is desired from a volunteer crop it is advisable to apply to the land in early spring and harrow in either a light dressing of well rotted farm manure or an application of about 150 lbs. per acre of complete artificial fertiliser, such as that generally used for Irish potatoes.

**Pests and Diseases.**—The growing crop is very free from pests and diseases in Rhodesia. It is sometimes attacked by caterpillars of the hawk-moth and the larvæ of a species of lady bird. In America numerous destructive diseases are recorded, and the loss due to these has been estimated at over 30 per cent. of the total crop. Our comparative immunity from diseases of the growing crop in this Colony is probably due to the fact that propagation has been carried out almost entirely by means of vine cuttings.

Before planting seed tubers they should be rigidly inspected, and any signs of disease or soft spots in the tubers, or bruises, should be searched for and the affected tubers rejected.

Certain serious diseases of the tubers in America are encouraged by alkaline conditions of the soil, and in such cases lime or wood ashes should never be applied to the land

as a fertiliser. In this Colony the tubers, after lifting, are very subject to attack by a form of soft rot. This is aggravated by bruising due to rough handling. Every effort should be made to avoid injury to the potatoes when lifting. Bruised or cut tubers should be fed first, and each lifting should be utilised or sold within a week or ten days of being raised.

## SUMMARY.

1. The sweet potato provides most valuable succulent feed for cattle, sheep and pigs.
2. The whole crop may be ensiled or the tops alone. The tops should be wilted before ensiling.
3. The green tops may be fed to all live stock in the fresh state and make an excellent green feed for autumn and spring.
4. The crop is hardy, and will grow on almost all soils, but prefers a fertile sandy loam.
5. An adequate supply of organic matter and potash in the soil is necessary.
6. Ridging the land does not appear to increase the yield in Rhodesia, but undoubtedly renders the crop easier to lift.
7. In Rhodesia the crop is generally grown from cuttings of the vines, but it may also be raised from shoots taken from tubers sprouted in moist soil.
8. One maize bag will hold about 600 to 1,000 cuttings, and about 9 to 12 bags of cuttings will plant an acre.
9. One bag of tubers should produce sufficient "sets" to plant one acre.
10. Cuttings or sets should be planted in moist soil when more rain is expected and as early in the season as possible.
11. In districts where the spring rains are usually late it is advisable to plant cuttings in February or January to mature in the following summer. They may be planted under maize.

12. Cuttings should be planted in rows 36 to 40 inches apart, allowing for 12 to 18 inches between the plants.

13. The crop should be cultivated until the runners commence to meet across the rows.

14. The crop is usually lifted with the plough, but only as many tubers should be lifted at a time as will be utilised within a week or ten days.

15. The tubers may be left in the soil throughout the winter without injury, to be lifted as required.

16. The succulent vines or cuttings rapidly heat and rot, especially if taken during very humid weather. Due thought should be given to this when bagging cuttings for sale or temporary storage.

# The Dairy Industry in Southern Rhodesia.

## CHEESE AS AN ARTICLE OF DIET.

By T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

*This article is written for the purpose of encouraging the consumption of Rhodesian cheese in this Colony. The Dairy Expert shows that cheese possesses a very high food value and does not deserve the reputation of being indigestible. In a climate such as ours, cheese can in a measure beneficially replace meat in the dietary, and the recipes given at the end of the article show how this may be done. If every European adult in the Colony were to eat half a pound of cheese per week, consumption would absorb about four times the amount of cheese produced to-day. We commend the thought to our readers.—Ed.*

Cheese-making, especially in Mashonaland, is increasing in popularity, and in a year or two new markets must be found or local consumption must be increased if sales are to keep pace with production. The following article is written, therefore, in the hope that a wider appreciation of the value of cheese, both raw and in a cooked state, will lead to more extended local sales, with a consequent greater encouragement to our cheese-makers to extend their manufacturing operations and increase their output.

**The Food Value of Cheese.**—Cheese is chiefly used in this Colony in small quantities because its flavour adds to the palatability of a meal, but it is well known that good cheese eaten with bread and butter forms a very wholesome diet, and the worth of this valuable foodstuff in time of war or in any emergency when fresh meat cannot easily be obtained is fully recognised. The extended use is to a certain extent hindered by the fact that there is a tradition that cheese is indigestible. That this tradition is without foundation has been amply proved by experiments conducted in the United States of America, where it has been proved that men fed on a diet of bread, fruit and cheese have maintained their health and developed the same amount of energy as others who have been fed on a mixed diet in which meat had a leading part. Indigestion may be caused by an excess of cheese eaten after a heavy meal, but the fault cannot be solely ascribed to the cheese. Any excess of nitrogenous food partaken after a meal would without doubt cause similar physiological disturbances. That cheese is a very highly concentrated foodstuff can be at once seen (as in the following table of analyses) when it is compared with other articles of diet.

*Analyses of Common Articles of Diet.*

| Food. | Waste. Per cent. | Water. Per cent. | Protein. Per cent. | Fat. Per cent. | Carbo-hydrates. Per cent. | Ash (mineral matter). Per cent. | Fuel value per lb. calories. |
|---|---|---|---|---|---|---|---|
| Cheese ... ... | ... | 34.2 | 26.2 | 33.7 | 2.4 | 3.8 | 1,950 |
| Beef of average quality ... ... | 18.6 | 50.5 | 15.2 | 15.5 | ... | 0.7 | 935 |
| Eggs as purchased ... ... | 11.2 | 65.5 | 13.1 | 6.9 | ... | 8.9 | 790 |
| Bread ... ... ... | ... | 35.3 | 9.2 | 1.3 | 53.1 | 1.1 | 1,215 |
| Potatoes ... ... | 20.0 | 62.6 | 1.8 | 0.1 | 14.7 | 0.8 | 295 |

Even a casual glance at the above figures shows that there is no waste when cheese is eaten, that the percentage of protein or muscle producer is extremely high and that its percentage of ash (or mineral salts) out-tops all other foods, with the exception of eggs, where the mineral salts are largely contained in the shell, which is, of course, discarded when eggs are used.

Mineral matter is essential for the formation of bone, blood and nerves, and in parts of this Colony where lime and phosphates are deficient it is well to remember that pound for pound cheese contains five times as much mineral salts as beef. It may here be remarked that the best cheese-making districts in England are all on a limestone formation: Cheddar district in Somerset, Leicestershire, Derbyshire being renowned for the quality of the cheese produced, and in this Colony the same feature can be observed.

The high percentage of protein in cheese—almost twice that contained in beef and eggs—also calls for more than a passing comment. Protein forms lean flesh and muscle and supplies energy. No other foodstuff contains so large a proportion of this valuable ingredient in such a concentrated and digestive form as cheese.

The fat contained in cheese is also a very valuable feature. It should be remembered that each pound of cheese contains approximately one-third of a pound of butter fat in a partially predigested form, and that fat supplies energy. The percentage of fat in the milk from which cheese is made has a very pronounced effect on the resultant quality of the cheese. This explains why so much early spring cheese in Southern Rhodesia is of inferior quality. Farmers who do not feed their cattle in the winter cannot expect the cows to put fat on their bodies and into the milk at one and the same time. As a rule the body comes first. Tissues which have been wasted during our long and dry winters have to be repaired before the cows recover such physical conditions as will enable them to produce milk of the richness necessary for successful cheese-making purposes. Cheese, therefore, made in the early spring frequently suffers from deficiency in fat and becomes dry, hard and unpalatable. The reason for this is that farmers do not realise that dairy stock must be maintained in good physical condition before calving. Until winter feeding—not only of cows in milk, but also of cows in calf—becomes more general in Southern Rhodesia, this Colony cannot be expected to produce dairy produce of the quality which the public has every right to demand. It is undoubtedly true that some farmers' negligence in this respect tends to give a bad name to Rhodesian cheese, and even those farmers who do their best to keep

their cattle in good condition suffer to a certain extent for the sins of those who take no steps to maintain the Colony's good name for a high standard of produce. The time, however, is rapidly approaching when cheese for local consumption will be graded, and those cheese-makers whose produce is inferior will be forced out of the market.

Rhodesia is an extravagant country and there does not seem to be any sale for produce which is under first grade standard. Second and third grade cheese is an absolute drug on the market and in consequence is usually sold at a loss.

**Type of Rhodesian Cheese.**—The cheese which is commonly made in Southern Rhodesia is of the Cheddar type. This is usually made from sweet milk, *i.e.*, morning's milk to which a "starter" is added. The use of evening's milk kept over until next morning is not advised, except in the months of May, June and July, when the coldness of the nights ensures good keeping qualities in the milk.

The cheese is usually made in moulds of either 7 or 11 inches in diameter, and the resultant cheeses weigh from 8 to 25 lbs. The smaller sized cheeses suit the larger households or smaller hotels, but the 25 lb. cheeses are usually for the cutting-up trade and are preferred by grocers. Fresh cheese which is not more than eight weeks old is generally favoured. This cheese has a mild flavour and cuts without waste. When cheese is kept too long it develops a "bite" and loses its waxy texture. In the dry season it cracks, dries out excessively and cuts badly, and a good deal of waste is caused. For this reason cheese older than three months, unless specially purchased as "cooking" cheese, is disliked by merchants and by the public generally.

Gouda or sweet milk cheese is usually consumed when quite fresh, *i.e.*, three to five weeks old. Being of small size, with an excessive amount of surface in proportion to its bulk, it is apt to dry out more rapidly than the Cheddar type and does not ripen so well. For that reason it does not make a good cooking cheese.

Soft cheeses such as cream cheese and cottage cheese, as usually made in this Colony, do not keep well and must as a rule be eaten within three days of their manufacture. They are therefore not used in preparing cooked dishes, but are best eaten in conjunction with salads, etc.

**The Care of Cheese in the Home.**—Some difficulty is often experienced in keeping cheese in a fresh and moist condition, especially during the dry season. When cheese is put into a covered dish it is essential that air gains free admittance; if not, it quickly becomes mouldy and rank in flavour. To keep the cheese moist it should be wrapped in a slightly moistened cloth and then in paper. Another method is to smear the cut surface with good butter.

When 10-lb. truckle-shaped cheeses are purchased it is best to cut a slice about a quarter of an inch from the top to act as a cover. The cheese should then be cut off as evenly as possible and the "cover" replaced. If the cheese below the "cover" tends to become dry, it should be covered with a damp cloth or smeared with butter.

Cheese must always be kept in a cool place. Excessive heat not only dries it out, but also melts out the butter fat. Too little attention is given to this point in many stores, especially in September, October and November, and the cheese suffers accordingly. As previously mentioned, cheese is often made at this period of the year from milk deficient in butter fat, and any exposure to high temperatures of course accentuates the trouble and quickly causes the cheese to become hard, dry and unpalatable.

**The Preparation of Cheese Dishes.**—It can definitely be stated that cheese can be used as a substitute for meat. It is, however, much more concentrated and there is no waste. Even if cheese costs 2s. a lb. it is more valuable as a foodstuff than beef or mutton at prices ranging from 10d. to 1s. 6d. per lb.

The following recipes, culled from the United States Farmers' Handbook No. 487 and from other sources, are given as typical dishes in which cheese is one of the main ingredients.

*Cheese and Onions.*

Boil two or three white onions in salted water until soft. Drain them and chop them into small pieces. Add pepper and salt and a teaspoonful of butter and four or five ounces of grated Cheddar or milk cheese. Stir well over fire until creamy (about five minutes). Serve on buttered toast.

### *Cheese on Toast.*

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| 2 eggs. | 1 cup bread crumbs. |
| 1 dessertspoonful butter. | About 2 ozs. grated cheese. |
| 4 tablespoonfuls milk. | Pepper and salt. |

Beat up the eggs, add milk, cheese and other ingredients; cook in saucepan; stir well over fire until cheese has melted. Serve on buttered toast.

### *Cheese and Tomatoes.*

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|---|---|
| 2 tomatoes. | 1 teaspoonful butter. |
| 2 tablespoonfuls milk. | 1 teaspoonful maizena. |
| 1 tablespoonful grated cheese. | Pepper and salt. |

Skin the tomatoes, cut them into small pieces and cook until soft, then add the butter, milk and cheese. Mix the maizena with a little milk; add this last of all. Boil for three or four minutes. Serve on buttered toast.

### *Cauliflower au Gratin.*

Boil a cauliflower. When done, drain all the water off. Put it in a pie dish and grate about $\frac{1}{4}$ lb. of cheese over it, then pour some melted butter or white sauce made with butter, flour and water over all. Dust with pepper and salt and bake for about half an hour.

### *Cheese Straws.*

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|---|---|
| 2 ozs. Cheddar cheese (grated). | Cayenne pepper and salt. |
| 2 ozs. flour. | Yolk of an egg. |
| 2 ozs. butter. | |

Rub the butter into the flour. Add the grated cheese, some cayenne and salt to taste. Mix with the yolk of an egg, roll out and cut into strips. Bake in a quick oven.

### *Macaroni Cheese.*

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|---|---|
| $\frac{1}{4}$ lb. macaroni. | 1 oz. butter. |
| $\frac{1}{4}$ lb. grated cheese. | 2 tablespoonfuls bread crumbs. |
| Salt and pepper. | $\frac{1}{2}$ teaspoonful mustard. |
| $\frac{3}{4}$ pint of milk. | |

Break up macaroni into short lengths. Put it into boiling water (slightly salted) to cover it well. Boil slowly for 20 minutes, then drain it and put it on again with the milk and boil till tender, but not broken. Take it off the fire and add the cheese, salt and pepper and mustard. Stir

well until the cheese has melted. Pour into a pie dish. Sprinkle with bread crumbs and put dabs of butter on top. Bake for 15 or 20 minutes.

### *Cream Cheese Sandwiches.*

2 ozs. cream cheese.
1 oz. butter.
1 teaspoonful carraway seeds.
Salt.

Mix all together and spread on rounds of buttered bread.

### *Cheese Fondue.*

1⅓ cupfuls of soft, stale bread crumbs.
6 ozs. cheese (1½ cupfuls of grated cheese or 1⅓ cupfuls of cheese grated fine or cut into small pieces).
4 eggs.
1 cupful hot water.
½ teaspoonful salt.

Mix the water, bread crumbs, salt and cheese; add the yolks, thoroughly beaten; into this mixture place the whites of eggs beaten until stiff. Pour into a buttered baking dish and cook 30 minutes in a moderate oven. Serve at once.

The food value of this dish, made with the above quantities, is almost exactly the same as that of a pound of beef of average composition and a pound of potatoes combined. It contains about 80 grams of proteids and has a fuel value of about 1,300 calories.

### *Scrambled Eggs with Cheese.*

½ lb. cheese, grated or cut into small pieces.
8 eggs.
1 tablespoonful of chopped parsley.
Pinch of nutmeg.
½ teaspoonful salt.

Beat the eggs slightly, mix them with the other ingredients and cook over a very slow fire, stirring constantly, so that the cheese may be melted by the time the eggs are cooked. In food value the dish is equal to nearly 2 lbs. of average beef.

### *Fried Bread with Cheese.*

6 slices bread.
1 cupful milk.
2 ozs. cheese or ½ cupful grated cheese.
½ teaspoonful salt.
½ teaspoonful potassium bicarbonate.
Butter or other fat for frying.

Scald the milk with the potassium bicarbonate; add the grated cheese and stir until it dissolves. Dip the bread in this mixture and fry it in the butter. The potassium bicarbonate helps to keep the cheese in solution. It is desirable, however, to keep the milk hot while the bread is being dipped.

### *Cheese Croquettes.*

3 tablespoonfuls butter.
¼ cupful flour.
⅔ cupful milk.
Yolks of 2 eggs.
1 cupful cheese in very small pieces.
½ cupful grated cheese.
Salt and pepper.

Make with a white sauce, using the butter, flour and the milk. Add the unbeaten yolks and stir well until mixed, then add the grated cheese. As soon as the cheese melts, remove from the fire, fold in the pieces of cheese and add the seasoning. Spread in a shallow pan and cool. Cut into squares or strips, cover with an egg and crumb mixture, and fry in deep fat.

# Leaf Spotting of Tobacco caused by Mosaic.

By J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.,
Chief Botanist and Mycologist.

Controversy and misunderstanding continue to exist in the Colony about the nature and behaviour of mosaic disease of tobacco, and it is with the object of dispelling some false illusions that the subject is again broached in this journal. It is quite time that a more serious view be taken of the deleterious effects of mosaic, not only on the quantity, but also on the quality—that is, marketable value—of the cured leaf, and it is distressing to find so many growers who still cling to the old belief that the disease is in no way harmful because the colour of the leaf is not impaired after curing. But the saleable value of tobacco leaf is not governed entirely by its colour; size, "body" and "feel" have to be considered, and it is these properties that are lacking in leaf reaped from mosaic-infected plants.

Farmers are able to recognise the disease readily by the mottling which develops in the foliage, and are usually content to leave it at that, but a closer observer will notice other symptoms. Firstly, growth is inhibited and the plant is stunted; secondly, the leaves are usually narrower and of thinner texture than the normal, whilst a high percentage cure out as "shorts." Then frequently malformation occurs, and the leaves may develop "blisters" or they may be so narrow that reaping is not profitable (Fig. 1); and under certain conditions spotting and "scorching" may develop to such an extent as to make the leaf quite valueless. Common types of spotting which have been found to be associated with mosaic disease are shown in the accompanying figures, all of which are reproductions of photographs of leaf grown in Rhodesia.

A common type of mosaic spot is shown in Fig. 1. It usually first becomes visible as a small circular brown spot, which gradually enlarges until it attains a diameter of about one-eighth of an inch. The spots rarely exceed this size, but may be very numerous and coalesce to form light brown blotches, in which the outlines of the original spots can be discerned. Usually a faint zonation may be observed in the individual spots, but there is never to be seen any yellow margin or "halo" such as is associated with bacterial diseases. Under certain conditions leaves showing this type of spotting may not exhibit any marked mottling, and it would be difficult for the average farmer to recognise the presence of mosaic; but if the plant is growing normally, the leaf mottling is always a prominent feature of the disease. Fig. 2 indicates a type of spotting which develops upon mosaic-infected Turkish tobacco. It will be noted that the spots are larger, more angular and of a darker brown than those shown in Fig. 1, but the zonation is well marked, although this does not appear in the illustration. What is generally known as sun scorch can be seen on most tobacco farms at some time during the season and may cause quite considerable losses. It is also well known in the Union of South Africa, having been described by Moore (1) in 1927, and is shown in Fig. 3. Minute brown spots first appear on the leaf between the veins, and increase in numbers to such an extent as to produce "rusted" or scorched areas half an inch or more across. These brown patches enlarge and run together until nearly the whole of the leaf surface may become a mass of torn shreds of dead tissue. Frequently mosaic mottling is entirely absent on "scorched" leaves, but it is usually present in leaves higher up the stem, and the connection between the two symptoms is easily established. Although the scorching is popularly attributed to the action of the sun, yet it is not always during periods of high temperatures or drought that this phase of the disease is encountered. Dull rainy weather extending over a period of weeks, such as was experienced during the past season, and unusually cold weather, have also been found to favour this scorching on mosaic-infected plants. In fact, observations made in the Colony seem to indicate clearly that the two forms of necrosis described, *i.e.*, spotting and "scorching," are definitely associated with periods of slow growth in

mosaic-infected tobacco plants. This point has been borne out in experimental inoculations with the mosaic virus. If made during the normal growing season, in all cases typical mosaic mottling without necrosis has developed, but if these experiments are carried out during the winter months, when the plants do not make rapid growth, it is always the spotting shown in Fig. 1 which develops first; sometimes a faint mottling may appear later, but it is never well marked. A third type of spotting, of which an extreme case is shown in Fig. 4, also results from mosaic infection and is accompanied by the usual mottling. Very small white spots, which develop as a rule in the dark green mosaic areas, are the first symptoms to be observed. They are usually bounded by a narrow brown margin, and as they increase in size they run together to form larger dead areas of a light brown colour, which contain the numerous, approximately circular, white spots placed close together. It has been found that certain fungi are often associated with the white spotting, and if weather conditions are favourable a considerable extension of the diseased area may be brought about by the growth of these organisms. In extreme instances, such as that in Fig. 4, the leaf may be rendered quite valueless after curing. It will be seen, therefore, that mosaic may reduce the value of a tobacco crop in several different ways, and it would be well for all growers to realise that the disease does not manifest itself solely as a mottling of the foliage.

Recent work in America has shown that similar conditions exist there with regard to leaf spotting, and an analysis of the effect of mosaic upon yield and quality of three successive crops has given most interesting results (2). It has been shown that a reduction in yield of 30 to 35 per cent. resulted from plants which became infected at transplanting time, and that the damage was almost as severe when infection took place one month later (approximately at the time of first priming). More startling still is the figure for loss in gross total value of the crop, which amounted to as much as 55 per cent. The average value per acre of the crop which was infected at planting out time was 103.56 dollars, as compared with 249.12 dollars for clean leaf. The reasons for this depreciation in value were the same as encountered in Rhodesia, namely, "shorts," thin texture,

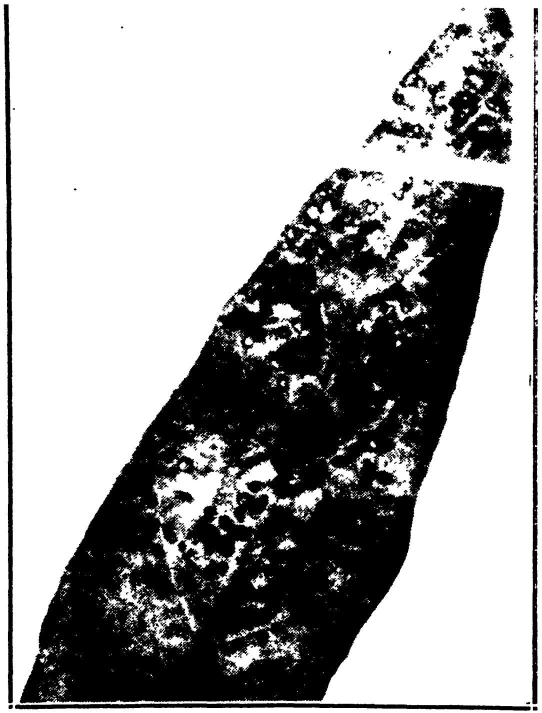

**Fig. I**
**A common type of mosaic spot.**

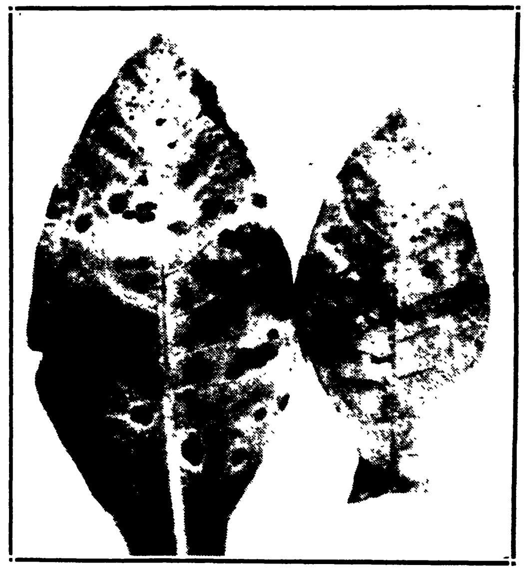

Fig. II
Type of spotting which develops upon mosaic infected Turkish tobacco.

Fig III.

"Scorch" associated with periods of slow growth in mosaic infected tobacco plants.

Fig IV.

White spotting which develops following mosaic infection.

spotting and discoloration. It is hoped that this warning of the dangers of mosaic will serve to bring about a definite resolve on the part of tobacco growers to eliminate the disease, which is becoming more widespread every year.

**Control.**—The measures which have previously been recommended (3) for the control of mosaic are based upon thoroughly practical considerations and have been found to be successful by those farmers who have carried them out efficiently. It must be remembered that mosaic of tobacco is one of the most highly infectious of plant virus diseases, so that the presence of a single mosaic plant is a menace to the crop. It may frequently be found—in fact, it usually is discernible—in the seed beds, to which it may be brought in a variety of possible ways, but observations indicate that refuse from infected plants of the previous season probably supplies the chief source of infection. It will be asked how this refuse reaches the seed beds, and the answer will in most cases be "as boys' snuff." It is well known that the natives make their snuff and *nyoka* tobacco from the suckers of plants which are not uprooted after reaping, and the fact is almost equally well known that almost every plant in an abandoned field is infected by mosaic. It has been shown conclusively in America (4) that dried tobacco leaf can remain infectious for years, so that there is every reason to believe that much mosaic in seedling plants is introduced by the "boys" when working on the seed beds. From the seed beds these plants are transferred to the lands and spread infection to a number of other plants with which they come in contact during the process. It is therefore necessary to remove all mosaic plants from seed beds as soon as they are discovered and at the same time to remove a margin of apparently healthy plants which may have contracted the disease.

Soon after transplanting, when the first few leaves grow out, an inspection should be made of the lands, and, provided the number is not excessive, any plants showing mosaic symptoms should be uprooted and removed from the land and the hole refilled by a healthy plant. A second inspection should be made a little later and the process of eradication repeated. In this way few if any infected plants should remain in the lands, but if discovered, some effort should

be made to prevent the infection being carried to healthy plants when the boys are priming. Some farmers are quite successful in putting on separate gangs to prime healthy and diseased plants.

When the crop is more mature little or nothing can be done to reduce the damage resulting from the disease, so that the need for drastic action at the beginning of the season is most urgent. The early removal of tobacco stalks is also to be commended, and the wise farmer will endeavour as far as possible to prevent his boys from smoking or using snuff whilst working on seed beds.

Removing infected plants as soon as they are found has given the best results locally in controlling mosaic.

## SUMMARY.

1. Mosaic disease causes a very substantial depreciation in the value of cured leaf, owing to the abundance of "shorts," poorness of texture, spotting and discoloration.

2. It is found in the seed beds and probably introduced by the natives' snuff or *nyoka* tobacco.

3. Control depends on drastic action early in the season, constant elimination of diseased plants being the best method to be adopted.

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# "Pinking" of Maize.

## REPORT OF A PRELIMINARY INVESTIGATION.

By T. K. SANSOM, B.Sc., Plant Breeder.

*(The results of this preliminary investigation indicate that "pinking" of maize, which is very prevalent in many parts of this Colony, and in the Union of South Africa, where it is known as "bloody butcher," is of a hereditary character. This being so, it is obvious that the line of attack is seed selection; in other words, the rigorous discarding of all maize showing signs of discoloration. We believe the investigation reported upon is the first of this nature to be undertaken in the sub-continent, and we commend what is written to the careful perusal of maize growers. The enquiry will be continued next year, and the results in due course published in this Journal. It is of interest to note that Mr. Sansom, who is in charge of this work, was the first Rhodesian to be sent overseas by the Government of this Colony for agricultural training. This he received at Cambridge University, where he worked under the tutelage of Professor Sir R. Biffen and Professor Engledow, two of the foremost authorities on plant breeding in the world.—Ed.)*

The objects of these investigations are to determine if possible the cause or causes of "pinking" in maize. Reports from various maize growers in this Colony and also from other centres indicated that pinking of maize, also known as "bloody butcher" elsewhere, was on the increase, and was

affecting the quality of their crops. In some districts it was stated that as much as 20 per cent. of the maize was affected, and it was also stated that, owing to such a large percentage of coloured grains among the white, when ground into meal, the latter was of a dirty brownish colour.

Various officers of the Department of Agriculture brought in specimens of pinked corn, and large numbers were also sent in by various farmers; it was therefore decided to conduct experiments to determine the nature of "pinking," and a preliminary account of the work done and the results obtained is here given.

This work was first undertaken by the Chief Botanist and Mycologist, but subsequently was taken over by the writer on his arrival in this Colony in November of last year. The writer is grateful to the Chief Botanist and Mycologist for helpful suggestions and for the collection of material which enabled the experiment to be carried out.

**Material.**—The material available for the experiment consisted of a large number of samples of varying degrees of "pinking." It was very noticeable that "pinking" was confined, almost without exception, to one type of maize; this type was characterised by having fourteen rows to the ear, the ear itself being of a fair length and having a good circumference. The grains themselves were characterised by being moderately dented but extremely starchy.

From the material available the following ears were picked:—

1. A deeply pinked ear of maize, which was labelled "Christian's Corn." This was obtained from Mr. H. B. Christian, of Ewanrigg Farm, near Salisbury. The grains were all very deeply coloured, the colour in this instance being almost red. The pinking extended from the crown of the grain down to about halfway to the tip cap. The grains were of the typical dent type, and as regards shape and size were a very fair sample; the ear had fourteen rows and the colour of the cob was white.

2. An ear the grains of which were only very slightly tinged with pink. In this instance the pinking was confined to the side of the grains along the Sulci—the grooves between the rows of grains. The crown of the grains was

completely white, and so also was the tip cap. The grains were also of the dent type, but were a little harder in texture than those of sample 1. The ear was to all intents and purposes a typical specimen of Salisbury White, except for the faint pinking on the sides of the grains along the sulci. This type of colouring was afterwards referred to as "pink blushing" to distinguish it from the very deeply coloured grains in sample 1.

3. An ear which appeared to be an ordinary Salisbury White ear, except that the grains at the tip of the cob to about an inch and a half down were faintly tinged. The rest of the ear was a normal white colour.

4. A pure Salisbury White ear. The seed from this was sown as a control.

**Laboratory Examination.**—Before sowing, an examination was made in the laboratory of the different samples of grain. A few of each kind were soaked in water until they became soft. Free hand sections were made with a razor, and in each instance it was found that the pink colour was situated in the hull. The endosperm was of the normal white colour. The pink colour disappeared from the hull on the grain being soaked for several days.

Germination tests were also carried out and daily observations were made. It was found that in the deeply pinked sample the radicle (rudimentary root) and the plumule (primary leaf bud) were also deeply pinked, whereas in pure Salisbury White (as pure as could be obtained) the radicle and plumule showed a certain amount of pink colour, but this was by no means so intense as in the radicles and plumules of the deeply pinked grains. There was no apparent difference between the time of germination of the two samples in the laboratory.

**Field Experiments.**—The field experiment was conducted on a plot of ground at the Salisbury Agricultural Experiment Station, the soil being a red loam, typical of the soil on the station. Sowing took place on 13th December on a good seed bed. The samples previously described were used for the experiment. Sample 3 was divided into—(1) those grains from the tip which were tinged with pink, and (2) the grains from around the middle of the ear which were pure white.

This made altogether five different samples. Two rows of Salisbury White were planted around the whole plot to overcome the border effect of the experimental plot. The material for the experiment was planted as follows:—

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| 1. Row planted with grain from very pinked ear. |
| 2. Row planted with Salisbury White grain. |
| 3. Row planted with grain with pink blush from tip of cob. |
| 4. Row planted with Salisbury White grain. |
| 5. Row planted with grain which all showed pink blush. |
| 6. Row planted with Salisbury White grain. |
| 7. Row planted with grain which was quite white; obtained from ear which had pink tip. |

Repeated.

All cultures had germinated and the first leaves were showing above ground by 18th December. There was no apparent difference in the *time* of germination, but the percentage germination was very striking. In culture 1 (see table), 96 per cent. of the seed sown germinated. It will be remembered that it was stated that, apart from the colour of the grains, this was a very fair sample. In culture 2, 100 per cent. of the seed sown germinated; this was a picked ear and was tipped and butted. In culture 3 only 76 per cent. of the seed sown germinated. It will be remembered that this seed was obtained from the tip of the ear. In addition to poor germination, the plants in this culture were behind those of other cultures throughout the whole growing period; not only were they later than those of other cultures, but they were very much less vigorous, and the yield of grain was only about half that of some of the best yields.

Fig. I
Showing maize plant infected with an extract of ground "pinked" maize.

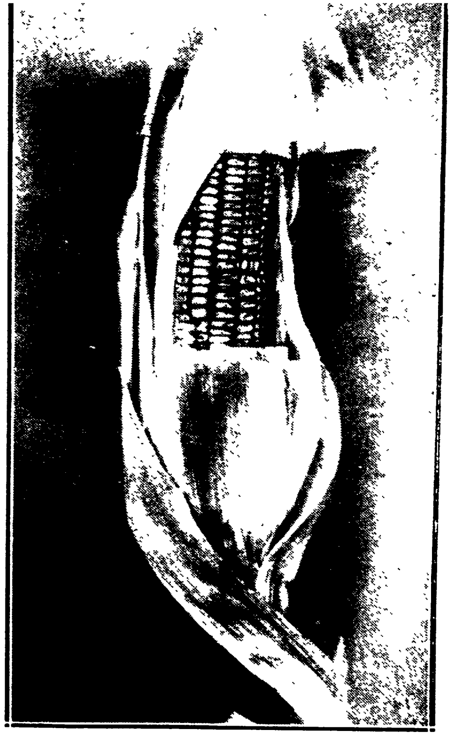

Fig. II.
Portion of husk cut away to determine effect of light upon developing grains.

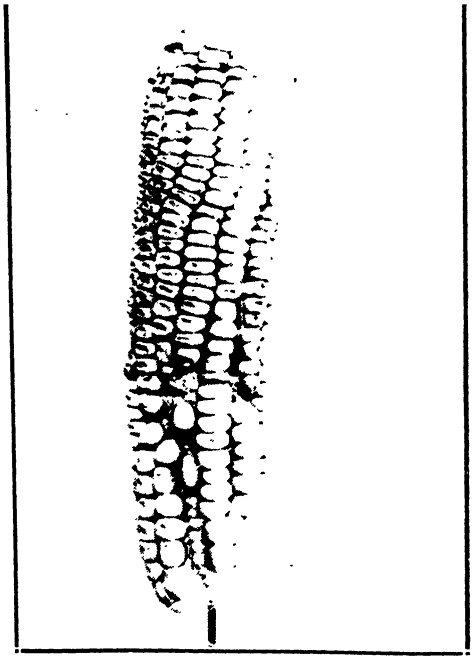

Fig. III.

An ear a portion of the husk of which was removed as in Fig. II. The developing grains were affected by light.

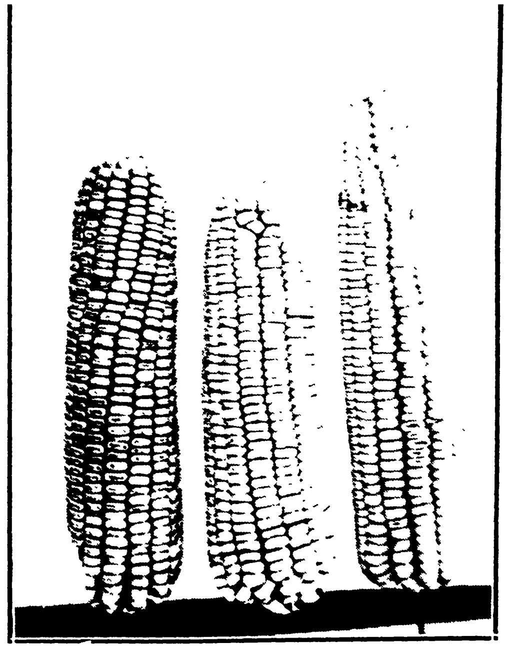

Fig. IV.

Showing three ears. Segregating for colour and also for length. These three cobs were reaped from the culture which was sown with deeply "pinked" seed.

These results were not merely coincidence, as the sowing plan shown above was repeated several times, so that all possible differences in soil were overcome.

In culture 5, which was a good sample, 95 per cent. of the seed planted germinated, and in culture 7, 100 per cent. of the seed planted germinated. This latter seed was obtained from the same ear as that of culture 3, only it was selected from about the middle of the ear, and only the best was planted.

**Field Work.**—Daily observations were kept, and for the first month there did not appear to be any difference between any of the cultures, except, of course, culture 3, which was planted with seeds from the tip of the cob.

It was not known whether "pinking" was due to a pathological disease or was a hereditary character, and to determine the former the following experiment was made. Two dozen plants from the Salisbury White cultures were selected and labelled. When these were sufficiently large a conical section was cut out of the stem and this was filled with a paste of ground pinked maize. This was covered up with adhesive tape (see fig. 1). A very careful record was kept of these plants, but not at any time throughout the whole of their life did they appear to differ in any way from the rest of the plants of the same cultures. To ensure that no crossing could take place with other plants, they were bagged and selfed. They were reaped separately and were examined very carefully in the laboratory for any sign of "pinking," but there was not a trace found on any cob. A few of these cobs were treated as shown in fig. 2 (described later). A certain number showed a pink tinge, due to the action of light, but this was no more accentuated than in those which were treated in the same way but which were not infected with an extract of ground pinked maize. From the results obtained from the past season's work it seems to be fairly definite that "pinking" is not a pathological disease.

When the plants were about a month and a half old it was noticed that a large number in culture 1 showed a distinct reddish-purple blotching. This reddish-purple blotch varied in degree of intensity; in some cases practically the whole plant was coloured as mentioned, whereas in others

the blotching was scattered over stems and leaves. This colouring became more intense the older the plants became. These plants could also be distinguished from the ordinary Salisbury White by having a very spindly appearance.

At flowering time the silks and tassels were a very bright purple colour. On examination of the tassel it was found that the anthers (pollen sacs) were a deep purple, which was a great contrast to the colour of the anthers of ordinary Salisbury White, which varied from a light yellow to a deep brown.

**Selfing and Crossing.**—Before the plants came into flower a certain number from each culture was labelled and bagged. In order to obtain pure seed for future work, ten plants from each culture were selfed. The remaining (20) plants from each culture were crossed both ways with those of other cultures.

The following experiment to test whether light is one of the causes of "pinking" was also done: Eight plants from each culture were selected, and the husks were removed, just about the time that the grain was in the green eating stage; a further eight plants from each culture were selected and a portion of the husk removed, as shown in fig. 2. The results of this experiment were very interesting. In nearly every case in the Salisbury White cultures the grains at maturity showed a pink blush in a varying degree of intensity. It was observed that this pink blush was more intense in those ears the grains of which were very starchy and dented; the more flinty the grain was, the less amount of pink blush was present.

In those ears which had only a portion of the husk removed, the grains in the area exposed to the light were "pinked," whereas the grains in that part of the ear which was left covered were the ordinary white colour (see fig. 3). Unfortunately the camera does not bring out the pink colour, but it will be observed that the grains in the upper half of the ear are darker than those in the lower half.

It is well known that exposure to light is the cause of this type of pink blush on certain varieties of maize. It was proved, however, that it is not necessary for the actual rays of the sun to fall on the grains, as it was found that the pink blush was present in some cobs where some of the

grain had been shaded by a portion of protruding husk; also a few ears were stripped of all but one or two layers of husk, and on examination after reaping it was found that this pink blush was present. The results obtained from the above-mentioned experiment will serve to emphasise the need for careful selection in the field of ears that are well covered by the husk. Salisbury White seems to be particularly susceptible to the effect of light when exposed to it. The pink blush of the grains obtained from the tip of the ear in culture 3 was due most probably to the tip of the ear not being properly covered with the husk, as a number of similar cases were observed in the experiment.

Those ears which were wholly stripped and also those which had a portion of the husk removed in culture 1 (pinked corn) did not show any sign of "pinking" at the time of the removal of the husk. The ears of those plants which showed a large amount of reddish-purple blotching rapidly became pink, but on examination after harvest they were no pinker than those which were left with the husks on. The ears of the normal-looking plants showed the same reaction to light as did those which were treated in a similar manner in the Salisbury White cultures. The remaining cultures also behaved in a similar manner.

**Harvest Data.**—Each culture was reaped separately and the ears were laid at the base of the plants from which they were stripped. An examination was made in culture 1 to determine whether there was any correlation between those plants which had reddish-purple blotching and colour of ear, and it was found that colour of plant was correlated with colour of grain. Those plants which were almost red in appearance bore ears the grains of which were deeply "pinked," and those plants which had a less amount of reddish-purple blotching also bore ears the grains of which were "pinked," but not so deeply "pinked" as in the former example. Plants which were typically Salisbury White in appearance bore ears the grains of which were white.

A count was made of all the ears in culture 1. An ear which showed any sign of pink was included in the pink category. The proportion of pinked to whites was approximately 9: 7, which is a Mendelian ratio. Not only was this culture segregating for colour, but also for length

of cob. Fig. 4 illustrates three typical ears taken from culture 1. The dark ear on the left of the illustration resembles the parent ear in all characters; the middle ear resembles the parent ear, except that the colour is less intense. The seed used for planting culture 5 is probably from a segregate of this type. The ear on the right, looking at fig. 4, is a white segregate. In this case colour is linked with length of ear. It will be noticed that the grains are not so starchy or dented as those of the ear on the left of the illustration. This long white ear is a very undesirable type, for it is extremely light, it tapers badly, there is a large space between the rows of grain and the grain is very shallow.

Culture 3 did not produce any pinked grains, except, of course, those which were exposed to light. The cause of the pink blush of the grains of this ear was probably due to the husk not covering the tip of the ear sufficiently. All cultures of Salisbury White produced only white ears.

In culture 5, which was planted with grain all of which had a pink blush, there was a proportion of "pinked" ears reaped, but none of them showed an intenser degree of "pinking" than the grains of the parent ear.

**Conclusion arrived at.**—There seems to be no doubt that "pinking," *i.e.*, the deep pink colour, is a hereditary character. Experiments this season have been sufficient to prove this, but to what extent a proportion of "pinked" grain in the seed would affect the quality of the resultant crop is a matter which will have to be tested in subsequent seasons. It is quite evident that any ear having "pinked" grain should be rigidly excluded from one's seed. Firstly, if it is deeply "pinked" it is, as far as has been proved this season, a hereditary character, and there is no doubt that through cross-pollination a large amount of other seed will be affected. Secondly, if it is only the "pink blush" form, this is without doubt due to the influence of light, and light can cause this pink blush only when the ear is insufficiently covered by the husk. Apart from this pink colour being an undesirable characteristic in a sample of seed, the mere fact that an ear has not properly been covered by the husk means that the exposed portion forms a very favourable spot for any diseases to start their infection.

It is not known how this "pinked" corn has become mixed up with the seed in this Colony. The Chief Agriculturist informs the writer that twenty years ago all the natives in the Colony grew an inferior hybrid maize, part flint, part dent. Ears of this maize, he said, could be seen everywhere in the kraals, showing dark blue, purple, red and yellow grains amongst the white or yellow, depending on the predominating colour of the ear. Gradually the natives replaced this inferior type with seed obtained from European farmers, and the original hybrid type largely disappeared. He suggests that this influence may still be seen in the outbreaks of "pinking" which occur. The writer has himself observed in the native territories in the Transkei, Cape Province, grains of the above-described colour, and as maize is normally a cross-fertilised crop, it is only reasonable to suppose that outbreaks of this kind should occur. Once a type has been infected in this way it will require very careful selection to get rid of undesirable characters such as "pinking."

**Control Measures.**—The most obvious method of control is to exclude seed from any ears the grains of which show signs of "pinking," for, as previously stated, if the grains are very "pinked" this is a hereditary character, and if allowed to be mixed with one's seed are liable to affect the quality of the crop to quite a marked extent. If the seeds have only a pink blush, then it means that the ear is not sufficiently protected by the husk, and in addition to having discoloured grain, the exposed tip of the ear is a very favourable spot for any disease to begin its source of infection.

"Pinking" or "pink blush" can very easily be distinguished from Diplodia or Fusarium-infected cobs. In Fusarium especially, it will often be observed that some of the grains have a pink colour, but the difference is that a Fusarium-infected grain always has a mouldy-looking appearance, whereas a "pinked" grain is normal in all respects except for its colour. Any results obtained from next season and subsequent seasons which will be of interest to farmers will be reported. Careful selection of maize in the field and after reaping is strongly recommended.

## SUMMARY.

1. It has been stated by farmers that "pinking" is on the increase, and in some districts is affecting the quality of the crop to quite a marked extent. Preliminary investigations have now been made to determine the nature of "pinking."

2. Results obtained from this season's work indicate that the deep pink colour is a hereditary character. This must not be confused with the "pink blush" very often seen. This is due to the action of light on the developing kernel. Nor must "pinking" or "pink blushing" be confused with fusarium. The latter, although often pinkish, can always be distinguished by the mouldy appearance of the infected grain.

3. The most obvious method of control is rigidly to exclude any ears the grains of which show the slightest trace of "pink," for in the first place, if the colour is a deep pink, then it is a hereditary character, and as maize is normally a cross-pollinated crop, it will affect the quality of the crop. If the colour is only a pink blush it means that the ear has been insufficiently protected by the husk. This unprotected area is a very favourable spot for any diseases to start their infection.

4. Salisbury White seems to be particularly susceptible to the effect of light on the developing kernels, therefore in selecting seed in the field select *only* those ears which are well covered by the husk.

# Iodine in Animal Nutrition.

By J. PARK HAMILTON, District Veterinary Surgeon, Gwelo.

All stockowners are or should be interested in the question of animal nutrition, because naturally the profits derived from animal husbandry depend directly on this question, and any factor which hinders the normal bodily growth should be their concern, and likewise anything which corrects the deficiency is to their interest. Among the factors controlling the growth of the body are certain glands called internal secreting glands, the best known of which is the thyroid gland. These glands depend on certain mineral elements for their proper functioning, and one of the most important of these minerals is iodine. Should there be a marked deficiency of iodine in the diet, then disease will result, and in the case of humans will be shown by goitre cretinism, etc., while in animals unthriftiness, lack of growth and rickets. There may, however, be only a sufficient deficiency to mitigate against the animal attaining normal development; in other words live stock may be receiving proper attention and yet doing only fairly well owing to an absence of iodine. Experiments in recent years practically throughout the world have indicated that in many areas there is an iodine deficiency, and by the addition of small quantities of iodine to the diet a general improvement in health has resulted. I think it may be taken for granted that a mineral deficiency exists to some extent in the natural grasses and soils of Rhodesia; this is evident by the improvement which takes place in stock when salt and bone meal are added to the diet. I do not know to what extent there is also an iodine deficiency, but it is possible that some of the difficulties the stockowners have, such as unthriftiness in young cattle, sheep lambing down with weakly lambs and insufficient milk, breeding pigs having small and delicate litters, may be due to this. The administration of iodine elsewhere, both in

scientific institutions and by the farmers themselves, has frequently given excellent results in combating these defects, and I think iodine might be tried in such cases in Rhodesia. The latest research work has shown that very minute quantities of iodine are sufficient to supply the required amount for health.

Having briefly stated the relationship of iodine to health, its application and general use may be considered. The usual way to administer iodine is in the form of potassium iodide, which, in addition to being readily absorbed, is odourless and practically tasteless. The cost is around 27s. a lb. in Rhodesia.

**Iodine for Cattle.**—The classes of cattle most likely to benefit from iodine are young stock, pregnant cows and dairy cows. The iodine may be added to a salt lick in the proportion of three ounces of potassium iodide to each hundred pounds of salt. This is best done by dissolving the iodide in a quart of water and sprinkling it evenly over the salt. Or a mineral mixture may be prepared and so much added to the food daily. A suitable mixture is:—

| | |
|---|---|
| Bone meal or bone flour ... ... ... | 40 lbs. |
| Ground lime (slaked) ... ... ... ... | 40 lbs. |
| Salt ... ... ... ... ... ... ... ... ... ... ... | 25 lbs. |
| Potassium iodide ... ... ... ... ... ... ... | 3 ozs. |

The potassium iodide is dissolved in a bottle of water and sprinkled over salt; when dry this is thoroughly mixed with other ingredients. This mineral mixture should be added to the concentrated food, in the proportion of 2 to 3 lbs. to each 100 lbs. of food. If this is not a convenient method, then a dose of the mineral mixture from a teaspoonful for calves to a tablespoonful for mature cattle may be given daily in food.

**Iodine for Pigs.**—It is well known that pigs to be profitable must suffer no check in their growth, and it is usual to add a quantity of a mineral mixture to the food. A good mixture is:—

| | |
|---|---|
| Bone meal or bone flour ... ... ... | 25 lbs. |
| Ground lime (slaked) ... ... ... ... | 25 lbs. |
| Salt ... ... ... ... ... ... ... ... ... ... ... | 15 lbs. |
| Wood ash ... ... ... ... ... ... ... ... ... | 15 lbs. |
| Sulphur ... ... ... ... ... ... ... ... ... ... | 5 lbs. |
| Iodide of potassium ... ... ... ... ... ... | 3 ozs. |

Dissolve iodide as previously directed and give 2 lbs. of mineral mixture in each 100 lbs. of food. The above is specially good for sows in pregnancy and suckling, and experimentally it has been shown that the young pigs are much stronger and more likely to survive when the sow has had such a mineral mixture.

**Iodine for Sheep.**—Sheep farming in certain areas is receiving a good deal of attention, and the farmers concerned are having a fair measure of success. It is frequently found that ewes lamb down without sufficient milk, and also a number of weakly lambs are born. This could in part be avoided by the extra feeding of the ewes during pregnancy; but the need for a mineral mixture is also indicated, and this is best given in the form of a lick. For this purpose the following should be very suitable:—

| | |
|---|---|
| Bone meal or bone flour ... ... ... | 40 lbs. |
| Ground lime (slaked) ... ... ... ... | 30 lbs. |
| Salt ... ... ... ... ... ... ... ... ... ... | 30 lbs. |
| Potassium iodide ... ... ... ... ... ... | 3 ozs. |

The iodide to be dissolved in a bottle of water, sprinkled over the salt and the other ingredients, then added and thoroughly mixed, or if on account of economy it is desired to provide salt only, then potassium iodide can be added at the rate of 3 ozs. to every 100 lbs. of salt. It is, however, a very doubtful economy to deprive live stock of any of the essentials of good health.

**Iodine for Poultry.**—Poultry farming is perhaps the most profitable branch of farming to-day in Rhodesia, and poultry farmers know the importance of keeping their laying birds in as perfect a state of health as possible. The addition of a mineral mixture is essential if the best results are to be obtained.

The following experiments were made by the Rowett Research Institute, Aberdeen, and the West of Scotland Agricultural College:—

**Experiment No. 1.—**

| Control Pen. | Experimental Pen. |
|---|---|
| Average egg production per pullet for a year. | |
| 107 eggs, average weight 60 grams. | 178 eggs, average weight 57.6 grams. |

**Experiment No. 2.—**

| | |
|---|---|
| Average egg production per pullet for five months. | |
| 61.1 eggs, average weight 51.1 grams. | 71.4 eggs, average weight 59.9 grams. |

In the above experiments the experimental pens were given an iodised mineral mixture with their food. The following is a suitable iodised mineral mixture:—

| | |
|---|---|
| Bone flour ... ... ... ... ... ... ... | 50 lbs. |
| Finely ground limestone ... ... ... | 20 lbs. |
| Salt ... ... ... ... ... ... ... ... ... | 10 lbs. |
| Sulphur ... ... ... ... ... ... ... ... | 5 lbs. |
| Oxide of iron ... ... ... ... ... ... | 2 lbs. |
| Potassium iodide ... ... ... ... ... | 4 ozs. |

Dissolve the iodide in a cup of water and sprinkle over salt, then thoroughly mix all ingredients; 2 lbs. of the mixture to be added to 100 lbs. of wheat offals, or if desired only to give them iodine, then ½ oz. of potassium iodide may be dissolved in a bottle of water and a teaspoonful of this added to each gallon of drinking water two or three times weekly.

# Talks to Poultry Keepers.

## THE CLOSE OF THE HATCHING SEASON AND AFTER.

By H. G. Wheeldon, Poultry Expert.

Very little hatching is done after August, as the chicks hatched during the months of September and October in Rhodesia are seldom profitable, nor do they make the headway in growth which is desirable, especially for egg production purposes. Hatching at this time of the year is almost entirely restricted to the production of water-fowl and turkeys. Although some poultry keepers have been waiting many months for broody hens, it is hardly worth while utilising them now to hatch hens' eggs. The warm weather is sure to bring many occupants to the nest boxes, and they will remain there for weeks unless prompt measures are taken to cure them. The eggs which are laid in the nests by the other birds are likely to be affected and lose their quality if allowed to remain under broody hens even if they are infertile. Broody hens in the laying flock should be taken in hand immediately they begin to cluck and not allowed to sit at all, as the longer treatment is delayed the more difficult it will be to put them off the brood. The simplest and most humane method is to place the broody hens at once in a coop with slatted bottom and the coop elevated several inches above the ground. Such birds must be fed and watered as usual and given plenty of green food to keep them up in laying condition and to encourage egg production as soon as possible. If the hens are attended to as soon as they show signs of broodiness they can be cured of it in three days without much loss in egg production.

Good breeding stock should be given some attention during the off season and not just cast aside or placed with

the laying flock and then lose all trace of them. A run should be provided for the females, and the males penned separately in suitable coops with a run. It is wise, especially just before the moulting period, to allow the hens from the breeding pens to sit when they go broody on two or three china eggs; this would give them a rest and help them through when moulting. After sitting for about 10 days they may be placed in the broody coop to break them of it. Such treatment generally causes the hens to moult, get quickly through it, and they will begin to lay again in good time for the next breeding season. It is not advisable to breed from birds that are moulting, whether males or females, as their vitality is at a low ebb, and chickens hatched from such birds are not of the strongest. It is for this reason that some attention should be given to the breeding birds during the moult, as by proper attention and feeding they can be got through the feathering process in good time for mating up, otherwise they may continue to moult late in the season and usually during the time they are urgently required for the breeding pens, which was the case in many poultry yards this year.

Due consideration should also be given to the incubators before disposing of them for the season. It is very easy to push them aside until next season, but if they are cleaned first and the egg trays disinfected, the oil and water emptied, the metal work cleaned and slightly greased to prevent rust, and packed neatly away, it will save a great deal of trouble when they are wanted again. Paraffin oil does not prevent rust, but rather induces it, although it is useful for removing rust. It very often spreads up to the flues and chimney of the incubators, so it is very wise to drain and dry out all the reservoirs before putting the machines away. All the other appliances which are finished with for the season should be cleaned and similarly treated.

From now onwards efforts must be concentrated mainly on the rearing of the future laying stock, work that must be pursued consistently throughout the next few months. The young stock must be kept growing normally and without any forcing. The earliest hatched pullets may have a tendency to lay prematurely, and in such cases it is advisable to reduce the animal food to a minimum. The subsequent hatches, however, will show a less tendency in this

respect and will grow to maturity normally and will lay larger eggs than their early sisters. Adequate growth and development of both pullets and cockerels cannot be as perfect as it would be if the sexes are separated as soon as the sexual instincts begin to assert their influence. Separation of the sexes should take place as soon as they can be recognised. When cockerels are allowed to run on with the pullets indefinitely—this is specially true with the light breeds—the pullets can be noticed in almost every case to be undersized, lacking in full normal development, and it is a sure way of causing premature laying, the result being small eggs. The cockerels, too, will neither make good breeding stock, nor will they attain good size and robust development, such as is required for stock to produce sturdy chicks.

A steady, sustained growth from start to finish is of such great importance that no one can afford to ignore it. Within the immediate future—a very busy period—the young growing stock of the various breeds will steadily increase in size as well as in numbers. They will require frequent changing to fresh ground, more roomy sleeping accommodation and a wider range. When the chicks are six to eight weeks old and well feathered, they should be placed in more spacious quarters and the cockerels separated from the pullets. The cockerels may be placed on range away from the pullets in suitably constructed, portable grass houses, and when they are 1½ lbs. in weight they should be fed on fattening foods for a month, then disposed of for table purposes. The poultry farmers who are interested in stud stock should select the robust, vigorous cockerels that are free from standard defects and rear them for future use as breeders. The pullets should be well attended to and not overcrowded, with a view to maintaining a steady normal growth. They should be provided with shade and water during the hot weather, and their sleeping quarters kept in clean sanitary condition.

During the hot weather there are frequent complaints to the effect that the young stock have stopped growing. They have ceased to make that visible progress day by day, and seem to be listless and wanting in vigour. A temporary cessation of growth may be expected in chickens three months old that are completing the growth of their plumage.

This is transitory and soon passes, but chicks may flag or become droopy before or after this stage from quite different causes. In young and old chickens external parasites may be the cause, also monotony brought on by too close confinement in the same run, or on stale ground, will check the growth, the remedies for which are obvious. If flagging is due to no apparent reason, a change in the menu, such as moist mash, often has beneficial results. A tonic or the addition of mineral salts to the mash will bring about the desired results in the hot weather.

The following formula can be recommended for growing stock and laying birds:—

*Potassium Iodide Mixture.*

| | |
|---|---|
| Bone meal ... ... ... ... ... ... ... ... ... | 50 lbs. |
| Finely ground limestone ... ... ... ... | 23 lbs. |
| Common salt (fine) ... ... ... ... ... ... | 20 lbs. |
| Sulphur ... ... ... ... ... ... ... ... ... ... | 5 lbs. |
| Oxide of iron ... ... ... ... ... ... ... ... | 2 lbs. |
| Potassium iodide ... ... ... ... ... ... | 4 ozs. |

Add 3½ lbs. of this mixture to 100 lbs. dry mash and mix well.

There seems to be a forward move among poultry keepers to record an increased number of pullets yearly, and others who have not yet started to trapnest or single pen a percentage of the young stock are giving this important matter their consideration. All are agreed that without records it is most difficult to make anything like definite progress in breeding. When selecting the pullets to be recorded, choose those which are well grown and symmetrically developed, with good size and substance. It is sometimes imagined that the selection of the pullets is of minor importance, and it is only the male that requires careful selection. This is not so, as both the male and female are capable of transmitting their good or bad qualities to their offspring, and consequently they should both be carefully selected. Constitution, vigour and quality are of first importance in both parents to produce profitable stock. The pullets which are to be recorded must be of standard size, as the best of these will be used as future breeders. It is the female side of the breeding pen which is largely responsible for the size and constitutional qualities of well reared stock.

# The Diplodia Menace.

## TREATMENT OF SEED MAIZE.

*We have received the following interesting letter from Mr. T. J. Mossop, Protea, Glendale. We shall be pleased to publish any communication of a similar nature having for its object the elucidation of problems which may arise in the application of this new practice in Rhodesia.—Ed.*

"The introduction and adaptation to our needs of 'Tillantin R' promises to be the most directly helpful response of the Agricultural Department to the cry of the maize grower for many years past.

"Attention has already been drawn by the Mycologist himself to the fact that this seed treatment of maize will not remove the source of field infection nor the outward signs of the disease as seen in the resultant crop, and these points cannot be too well rubbed in.

"There is, however, a pitfall which has not to my knowledge been pointed out. Many maize growers, whether they know it or not, regularly plant for a stand greater than the optimum, and more often than not they get away with it, owing to the failure of some seeds to produce a mature plant, thereby allowing space for the others to do so. With dressed seed, however, these growers will produce stands so thick that the crop yield will not only be reduced, but the cost of harvesting will become greater owing to the large number of low-yielding plants per acre. It might be advisable for each user of treated seed to consider this point and to make allowances if necessary.

"The intensely poisonous nature of treated seed is in some degree to the good. My imagination, however, produces visions which strike terror in me! It is a pity to allow a thief to become poisoned if he be a useful member of the planting field staff.

"Could not the Mycologist suggest a pronounced stain—preferably blue, green or black—which might be added with the 'muti' at the time of treating the seed—a stain which cannot react, wet or dry, on the 'muti'? A label on the bag is not sufficient in Rhodesia. Each grain should bear its trade mark—the skull and crossbones."

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The Chief Botanist and Mycologist comments as follows on the points raised in the foregoing letter:—

It is always gratifying to officers of the Department to discover amongst farmers a sufficiently keen interest in investigational work being carried out in the Colony to induce them to offer friendly criticism and helpful suggestions.

Mr. Mossop, in his letter, draws attention to the problems which confront the practical farmer who wishes to use "Tillantin R" dust to treat his seed against Diplodia, and there is little doubt that the points which he raises have been discussed on many farms during the past few weeks. In the first place it is extremely important that every farmer should realise at once that seed treatment will remove only one phase of the disease; some system of efficient field sanitation during the dry season must be evolved in order to reduce the proportion of mouldy seed in the reaped crop. If Mr. Mossop will assist in rubbing in this point he will be doing the maize growers a very good turn.

With regard to planting distance, it is difficult to lay down hard and fast rules. Every farmer knows roughly what kind of germination he may expect from the methods which he adopts, but the effect caused by Tillantin treatment under field conditions is somewhat of a speculation in this first year of its use in Rhodesia. Germination experiments in the laboratory have shown an increase in treated over untreated seed of roughly 15 per cent.

The question of a distinctive colour for treated seed by the use of a dye mixed with the dust presents a number of difficulties, but is well worthy of consideration when time permits. I think, however, that there is little danger of natives being poisoned, since dressed seed possesses a distinct and pungent odour likely to dull the appetite of any petty pilferer. Every effort should, however, be made by all farmers using Tillantin to obviate the possibility of treated grain becoming mixed with untreated.

# Review.

## THE COMPOSITION OF PASTURES.

By J. B. Orr, D.S.O., M.C., M.A., M.D., D.Sc.

(Printed and published by His Majesty's Stationery Office; 38 pp.; price, 9d.)

This report, a recent publication of the Empire Marketing Board, is of particular interest to Rhodesian agriculturists at the present time, owing to the fact that experimental work on the subject will be commenced in the near future by our Department of Agriculture, through its Chemical Branch. The matter has been dealt with already by Dr. Orr, though much more fully, in "Mineral Pastures and their Relation to Animal Nutrition," a book which everywhere has received deservedly most favourable criticism.

A preface by Mr. L. S. Amery points out that co-operation in the pasture research now in the process of being undertaken throughout the Empire has been secured largely through the instrumentality of a sub-committee of the Civil Research Committee of the Cabinet. This Committee was appointed in 1926 to report on the relationship between the mineral content of pastures and their nutritive value, and on its recommendations grants were made by the Empire

Marketing Board to various Governments within the Empire for investigations on the lines of research dealt with in this booklet, which is the first general account of these investigations to appear.

Beginning with pasture composition from the veterinarian point of view, and pointing out that the early investigators on nutrition were concerned chiefly with proteins, fats and carbohydrates, the author explains that the present review confines itself entirely to deficiencies in the mineral composition of pastures. He then passes on in the next two chapters to a comparison between the mineral composition of a good pasture and that of an uncultivated or natural one, giving examples of analyses from various parts of the world, including Scotland, Kenya, Nigeria, Falkland Islands, Australia. These analyses show plainly how in general the natural herbage is markedly the poorer in mineral elements, and to a lesser degree in protein. More extended examples illustrate the fact that "a pasture poor in minerals is ill adapted for maintaining rapidly growing modern breeds in health."

The following is also particularly pertinent to us in Rhodesia: "In developing animal husbandry in new countries, sires of improved breeds have been imported to 'grade up' native cattle without any 'grading up' of the pastures."

The next two chapters deal with various forms of disease attributable to deficiency of minerals in pastures, and the effect of these deficiencies on rate of production, and the results of investigation into these troubles are summarised and discussed briefly. The lack of phosphorus or calcium is believed to be primarily responsible. The author continues by showing that deficiencies have an effect on resistance of grazing animals to other diseases apart from specific deficiency ones, pointing out that "pastures deficient in minerals tend to be poor in other nutritional qualities."

Now follows a long chapter on the factors affecting the composition of pastures, these being classed under four headings—Species of Plants, Seasonal Variation and Stage of Growth, Climatic Conditions and Composition of the Soil. Two interesting statements appear here. The first is that in periods of drought the phosphorus content of the

herbage falls markedly, a peculiarity which has been noted repeatedly in connection with pasture analyses in our own laboratory; and the second is that the application of fertilisers to soils conserves the soil moisture and so allows the herbage to retain longer its green colour.

The report closes with a chapter showing the immense value to the Empire of wide-flung research into these matters, pointing out that the information we already possess "warrants the belief that the carrying capacity of pastures can be greatly increased and the health and quality of animals grazing on poor pastures can be much improved."

The publication is not couched in ultra-scientific language and can be recommended confidently as of extreme interest and value to all interested in stock rearing, veterinary work or general agriculture.

A. P. T.

# Empire Tobacco in England.

The following is taken from the Trade Journal *Tobacco* of 1st July:—

"Some index to the progress of Empire brands is afforded by observation of the counter sales. A still surer one is in the figures showing clearances of the raw tobacco from warehouse. From Messrs. Frank Watson & Co., Ltd.'s, very thorough statistical survey of the situation, it is seen that in April 2,504,690 lbs. of Empire tobacco were cleared, this being a proportion of 17.32 per cent. to all tobaccos cleared. In March the ratio was still higher, at 18.93 per cent. Thus it is obvious that the brands in which Empire tobaccos are entirely or partly used are growing in popularity. The new packets of Empire tobacco are now so much part and parcel of the tobacco dealers' turnover that it seems difficult to imagine the trade without them. Yet the new smoking material has only made way in recent years. In 1919 only 1.01 per cent. was the ratio to total clearances, and in 1920 3.20 per cent. There can be no doubt that the growing success of the Empire brands rests on improvement

in quality, and also the fact that in these brands the smoker is burning, so to speak, more tobacco and less tax for his expenditure. The Empire Marketing Board are doing their part in helping to popularise the brands. The new posters showing tobacco plantations in Southern Rhodesia and Nyasaland are effective, both as art and as propaganda. They are calculated to induce a trial of the Empire tobacco on the part of smokers whose allegiance to the old brands has as yet been unshaken.

"From the growers' and the tobacconists' point of view some adjustment is still due. The over-production in Rhodesia and some other tobacco districts of the Empire meant the dashing of the hopes of many a gallant fellow. It was unfortunate, but that phase is rapidly passing. Every agriculturist, whether a tobacco grower in the Colonies and Dominions, or whether a fruit farmer at home, has to adapt his output to the market. However, young tobacco countries can hardly be expected to exercise a foresight so exact that it can determine beforehand what the demand will be. Especially so as even experienced growers in America have on many occasions fallen into similar miscalculations. Rationalisation is in the air, and its adoption by Empire growers would mean a careful survey of present demand, a review of the probable supplies of Empire cigarette tobaccos, and cultivation on a scale which fits the situation. One is glad to see that the available stocks of Rhodesian, South African, Nyasaland, Canadian and Cyprus tobaccos are gradually being absorbed. The grower has the encouragement that he is providing for an increasing market. His problem is to estimate the increase in the use of Empire tobaccos, together with the present considerable stocks, and to concentrate on quality of leaf, and careful grading and packing.

"The present danger is that an actual shortage of Rhodesian bright cigarette tobacco is possible. This statement, in view of the existing surplus of leaf, may be considered as paradoxical. Yet with a large percentage of growers out of business and 'down and out,' with the absence of any guarantee of a succession of good seasons for the remaining growers, a shortage and not over-production may be the true prospect. Some measure of co-operation between the market and the growers should be at once set on foot. The sympa-

thetic co-operation of the governments at home and in Africa would be a useful official background for a common understanding between growers and the market at home. The pendulum of production should not be allowed to swing uncontrolled from congested crops to shortage. A steady supply at prices remunerative to the grower should be the basis aimed at. Any other basis, founded on opportunism and ignorance of the best interests of growers, users and the Empire, is unwise. One notes that last month the Legislative Assembly at Salisbury, Rhodesia, accepted a motion to appoint a Select Committee to enquire into the present position of the tobacco industry, and to suggest remedies for any of the difficulties that are retarding its progress."

# Farm Practice at the Government Farm, Gwebi.

## AN IMPROVED CLOD CRUSHER.

In the issue of this Journal for April, 1928, there appeared illustrations of a spiked roller devised by the manager of the Gwebi Farm for the purpose of breaking up the extremely large and heavy clods left by the plough during winter and spring ploughing. One of the illustrations showed a striking contrast between land which had been rolled and land which had not been rolled. This roller has continued to give excellent service, but it has been found that the feet of the oxen employed to haul it will not stand the hard going over the rough land. To overcome this difficulty the manager of the Gwebi Farm, Mr. Wright, has now constructed a smaller roller of the same design which is drawn behind the plough. The illustrations reproduced show clearly the manner in which the roller is operated and the nature of the work performed. At the time the photographs

were taken there were four of these rollers in commission at the farm.

The chief advantage of the implement is that it breaks the clods immediately they are turned up by the plough and when they are comparatively soft. Other advantages are:—

1. It saves rolling being done as a separate operation after the ploughing is finished.
2. No additional oxen or natives are required, as the ploughing and rolling are done in one operation.
3. Rolling at this time tends to pack the land lightly and thus helps to conserve any moisture present in the soil.
4. There are no clods to be crushed if the rains are late, and the land can be worked into a proper state of tilth with comparatively little precipitation.
5. The roller is inexpensive.
6. When ploughing is finished two or three rollers can be adapted to make one large land roller at little extra cost.

In conclusion, it should be mentioned that Mr. Wright, the inventor of the roller, has taken out a patent for it.

Close up view of the spiked roller used at Gwebi Farm, showing ploughing and rolling being done in one operation. Note the large clods being turned up by the plough. These will be pulverised when the next furrow is ploughed.

The land on left has not been rolled. That on the right has been ploughed and rolled in one operation. Gwebi Farm.

The stooking of maize permits of early ploughing

Land that has not been rolled, Gwebi Farm.

# Southern Rhodesia Veterinary Report.

## June, 1929.

### AFRICAN COAST FEVER.

MELSETTER DISTRICT.—A fresh outbreak occurred on the farm Wolfscrag, adjoining the infected farm Enhoek. Mortality, 1.

CHARTER DISTRICT.—The mortality during the month on the infected farm Victor was 8.

MAZOE DISTRICT.—Seventeen cases occurred on the infected farm Mari Plumbi. The slaughter of the infected herd on Sunridge was completed.

### HORSE-SICKNESS.

Eleven deaths were reported. Bulawayo 7, Salisbury 2, Marandellas 2.

### CUTANEOUS MYIASIS (SCREW WORM) IN CATTLE.

Cases reported from Mazoe, Mrewa and Matabeleland.

### TRYPANOSOMIASIS.

Cases have been recorded in the following districts:—Wankie, Hartley, Lomagundi, Darwin and Melsetter.

### QUARTER-EVIL.

Mortality has been reported from several districts.

### SCAB.

One flock in Mrewa and two in Melsetter district placed under licence.

### IMPORTATIONS.

From the Union of South Africa: Bulls 51, cows 102, heifers 54, horses 73, mules 31, donkeys 16, sheep 1,943, goats 518, pigs 19.

## EXPORTATIONS (CATTLE).

To the Union of South Africa for local consumption, 538. For overseas, 6,322. Belgian Congo: Slaughter 2,989, breeding 936. Northern Rhodesia: Breeding 34. Portuguese East Africa: Slaughter 48.

## EXPORTATIONS (MISCELLANEOUS).

Union of South Africa: Sheep 136, goats 104, pigs 28. Northern Rhodesia: Sheep 225, goats 36. Belgian Congo: Pigs 227.

## COLD STORAGE EXPORTS TO THE CONGO.

Beef: Carcases 283½, livers 96, tails 200, hearts 134, tongues 168, brains 100, cheeks 69. Calves: Carcases 30, heads 5. Pigs: Carcases 98. Sheep: Carcases 22.

# Southern Rhodesia Weather Bureau.

JULY, 1929.

**Pressure.**—The mean barometric pressure was slightly below normal, varying from 0.023 in. below normal at Fort Victoria to 0.008 in. above normal at Salisbury.

**Temperature.**—Temperatures in general were about normal, the mean temperature varying from 2.9° F. below normal at Hartley to 1.0° F. above normal at Shamva.

The mean relative humidity was about normal.

**Rainfall.**—A schedule of the stations reporting rain is attached.

ZONE A.—

| | |
|---|---|
| Umzingwane— | |
| Springs | .14 |
| Wankie— | |
| Tom's Farm | .02 |

ZONE B.—

| | |
|---|---|
| Belingwe— | |
| Bickwell | .09 |
| Bulalima-Mangwe— | |
| Semokwe Reserve | .06 |
| Chibi— | |
| Mtendelende | .10 |
| Insiza— | |
| Inyezi | .11 |
| Lancaster | .11 |
| Scaleby | .05 |
| Wanezi Mission | .05 |

ZONE C.—

| | |
|---|---|
| **Charter—** | |
| The Range | .02 |
| **Hartley—** | |
| Carnock | .04 |
| Cromdale | .18 |
| Meadowlands | .10 |
| Pulham | .15 |
| **Lomagundi—** | |
| Citrus Estate | .13 |
| Strathdon | .14 |
| Darwendale | .20 |
| Dedsi | .06 |
| Gambuli | .13 |
| Kapiri | .08 |
| Kenidia | .04 |
| Mafoota | .23 |
| Maningwa | .05 |
| Montrose | .02 |
| Mpandegutu | .37 |
| M'sina | .08 |
| Nyapi | .09 |
| Wari | .03 |
| Palm Tree Farm | .05 |
| Pendennis | .07 |
| Raffingora | .25 |
| Renardia | .18 |
| Richmond | .01 |
| Silater Estate | .37 |
| Sinoia | .03 |
| Umvukwe Ranch | .03 |
| Woodleigh | .34 |
| **Salisbury—** | |
| Ballineety | .63 |
| Bromley | .10 |
| Cleveland Dam | .02 |
| Gwebi | .15 |
| Salisbury Agricultural Department | .02 |
| Sebastopol | .11 |
| Stapleford | .09 |
| Western Commonage | .70 |

ZONE D.—

Darwin—

| | |
|---|---|
| Mount Darwin | .04 |

Inyanga—

| | |
|---|---|
| Juliasdale | .38 |
| Rhodes Estate | .42 |

Makoni—

| | |
|---|---|
| Ardlamont | .25 |
| Wensleydale | .33 |

Mazoe—

| | |
|---|---|
| Atherstone | .04 |
| Bellevue | 1.04 |
| Ceres | .03 |
| Citrus Estate | .13 |
| Craigengower | .08 |
| Donje | .04 |
| Glen Grey | .11 |
| Great B | .14 |
| Kingston | .12 |
| Maienzi | .27 |
| Mazoe Dam | .28 |
| M'gutu | .30 |
| Pearson Settlement | .32 |
| Rustington | .11 |
| Stanley Kop | .14 |
| Woodlands | .01 |

Mrewa—

| | |
|---|---|
| Montclair | .22 |
| Nyaderi Mission | .01 |

Salisbury—

| | |
|---|---|
| Arcturus | .45 |
| Chindamora Reserve | .15 |
| Goromonzi | .17 |
| Hillside (Bromley) | .23 |
| Meadows | .05 |
| Selby | .25 |
| Springs | .21 |
| Vainona | .03 |

ZONE E.—

| | |
|---|---|
| **Belingwe—** | |
| Belingwe N.C. | .24 |
| Doro | .15 |
| **Bikita—** | |
| Bikita | .75 |
| **Chibi—** | |
| Chibi | .06 |
| Lundi | 1.16 |
| Mpapas | .34 |
| **Chilimanzi—** | |
| Driefontein | .04 |
| Mtao Forest | .09 |
| Mukowries | .10 |
| **Gutu—** | |
| Glenary | .09 |
| **Inyanga—** | |
| St. Triashill | .04 |
| **Insiza—** | |
| Stoneham (Brac Valley) | .12 |
| **Makoni—** | |
| Bude | .08 |
| Craigendoran | .88 |
| Forest Hill | .08 |
| Inyagura | .18 |
| Ruati | .17 |
| Springs | .24 |
| Whitgift | .04 |
| **Marandellas—** | |
| Delta | .13 |
| Elandslaagte | .10 |
| Macheke | .13 |
| Marandellas N.C. | .15 |
| **Melsetter—** | |
| New Year's Gift | .02 |
| **Ndanga—** | |
| Doornfontein | .32 |
| Zaka | .33 |

Selukwe—

| | |
|---|---|
| Hillingdon | .07 |
| Safago | .12 |
| Selukwe | .20 |

Umtali—

| | |
|---|---|
| Argyle | .05 |
| Embeza | .63 |
| Fairview | .30 |
| Fern Valley | .08 |
| Odzani Power Station | .21 |
| Park Farm | .09 |
| Premier Estate | .16 |
| Sarum | .03 |
| Sheba | 1.11 |
| Stapleford | .52 |
| St. Augustine's Mission | .28 |
| Umtali Gaol | .20 |

Victoria—

| | |
|---|---|
| Cambria | .09 |
| Chevenden | .19 |
| Clipsham | .10 |
| Gokomere | .18 |
| Mashaba | .11 |
| Riverdene North | .10 |

ZONE F.—

Melsetter—

| | |
|---|---|
| Chikore | .64 |
| Lettie Swan | .28 |
| Mount Selinda | .68 |

Umtali—

| | |
|---|---|
| Cloudlands | .25 |

## Dates of Meetings of Farmers' Associations, Southern Rhodesia.

| Name of Association. | Place of Meeting. | Secretary. | Sept. | October. |
|---|---|---|---|---|
| | | | 1929 | 1929 |
| Ayrshire—Sipolilo | Various farms | G. H. Cautherley | 14 | 12 |
| Banket Junction | Banket Hotel | A. M. Hutchinson | 6 | 4 |
| Beatrice District | Farmers' Hall, Beatrice | W. Krienke | 26 | 31 |
| Bindura | Bindura Farmers' Hall | W. E. Fricker | 13 | 11 |
| Bromley | Farmers' Hall, Bromley Siding | E. Taylor | 4 | 2 |
| Bubi | Queen's Mine | C. H. Olsen | 10 | 8 |
| Bulawayo Landowners' and Farmers' Association | Library Buildings, Bulawayo | W. A. Carnegie | 12 | 10 |
| Chakari | Various farms | Lady Codrington | 18 | 16 |
| Daisyfield | Somabula (Sept.), Daisyfield (Oct.) | L. E. Edwards | 14 | 19 |
| Darwendale—Trelawney | Various farms | Charles H. Tanner | 25 | 23 |
| Eastern Districts | Farmers' Hall, Chidza | W. E. Richards | 14 | 12 |
| Enkeldoorn | Enkeldoorn | C. N. Ludlowe | 3 | 1 |
| Enterprise | Farmers' Hall | W. Stobart | 3 | 1 |
| Essexvale | Essexvale | Col. D. Judson | 15 | 20 |
| Felixburg—Gutu | Various Farms | A. J. Bradshaw | 14 | 12 |
| Figtree Branch, R.L. and F.A. | Figtree Hotel | The Secretary | 3 | 1 |
| Gadzema | Gadzema Hotel | H. G. M. Liddell | 13 | 11 |
| Gatooma | Speck's Hotel | Col. J. A. Smith | 21 | 19 |
| Gatooma (Golden Valley Branch) | Golden Valley Hotel | C. K. James | 14 | 12 |
| Gazaland (South Melsetter) | Farmers' Hall, Chipinga | J. Ward | 21 | 19 |
| Greystone | Quarrie Farm | P. J. van der Walt | 14 | ... |
| Gwanda | Lowenthal's Building, Gwanda | N. J. B. Nilson | 21 | 19 |
| Hartley | Hartley Hotel | S. H. Rylett | 14 | 12 |
| Headlands | Headlands | J. A. Eve | ... | ... |
| Hunter's Road | Hunter's Road | R. W. Twiffey | 28 | 26 |
| Insiza South | Farm Lancaster | J. Campbell | ... | 10 |
| Inyazura | Inyazura | W. P. Frudd | ... | 4 |
| Lalapansi | Lalapansi | B. J. Ingle | 14 | 12 |
| Lomagundi | Sinoia | F. W. Robertson | ... | 11 |
| Lomagundi West | Various farms | A. A. Bisset | 8 | 13 |
| Macheke | Farmers' Hall, Macheke | R. O. Jackson | ... | ... |

| | | | | |
|---|---|---|---|---|
| Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association | Various Farms | T. R. Colam | 7 | 5 |
| Makwiro | Makwiro | W. L. Parsons | 20 | 18 |
| Marandellas | Marandellas Farmers' Hall | E. Cruikshank | 6 | 4 |
| Marandellas, Southern | Various farms | B. V. Cherry | 4 | 2 |
| Mashonaland | Mashonaland Farmers' Hall, Salisbury | C. Lamb | 13 | 11 |
| Matobo South | Farmers' Hall, Malundi Farm | A. G. Allan | 21 | 19 |
| Matopo Branch, R.L. and F.A. | Farmers' Hall, Malundi | W. Mirtle | 21 | 19 |
| Mazoe (Concession) | Various farms | Douglas Southey | 13 | 11 |
| Mazoe (Glendale) | Farmers' Hall, Glendale | James S. Brown | 11 | 9 |
| Melsetter | Court House, Melsetter | J. C. Kruger | 12 | 10 |
| Midlands Farmers and Stockowners | Royal Hotel, Gwelo | T. R. van Rooyen | 11 | 9 |
| Ngezi-Umniati | Harvieston, Enkeldoorn | Miss Harvie | 28 | 26 |
| North Umniati | ——— | J. F. Eagar | Not | received |
| Norton and Lydiate District | Norton | R. D. Palmer | 6 | 4 |
| Nyamandhlovu | Nyamandhlovu | R. D. McLean | ... | ... |
| Odzi District Farmers | Odzi Hotel | F. H. Burnett | 7 | 5 |
| Poorte Valley | Various places | A. D. Wilson | 21 | 19 |
| Que Que | Offices of the Que Que Sanitary Board | A. A. Ackerman | 21 | 19 |
| Rusape Farmers' Association | Rusape | R. Munch | 7 | 5 |
| Salisbury South | Various farms | P. Linton | 25 | 30 |
| Selukwe | The Hotel, Selukwe | W. T. Simpson | ... | ... |
| Shamva | Shamva Court House | W. Stanley-Stollard | 20 | 18 |
| Two Rivers Farming Association | Various farms | W. L. Parsons | 21 | 19 |
| Umboe (Branch of Lomagundi F.A.) | Various farms | C. W. S. Ford | 14 | 12 |
| Umvukwe Farmers' and Tobacco Growers' Association | Various ranches | Com. E. Wrightson | 14 | 12 |
| Umtali | Drill Hall, Umtali | A. Howat | 5 | 3 |
| Umvuma and District | Umvuma | S. T. Montgomery | Not | received |
| Victoria | Victoria | G. E. Lamb | 7 | 5 |
| Wankie District | ——— | F. H. Going | Not | received |
| West Umvukwe Farmers' Association | Various farms | G. H. Gordon | 7 | 5 |
| Western | Plumtree Hotel | The Secretary | 14 | 12 |
| Willoughbys | Willoughbys | A. E. Roberts | Not | received |

# Export of Cattle from Southern Rhodesia, 1929.

| Month | Union | | England. | Congo | | N. Rhodesia | Portuguese East Africa. | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Slaughter | | Slaughter | | | | | | | |
| | Johannesburg | I.C.S. for overseas | On hoof | Slaughter | Breeding | Breeding | Slaughter | Trek | Breeding | |
| January ... | 66 | ... | ... | 2,222 | 272 | 12 | ... | ... | ... | 2,572 |
| February ... | 84 | ... | ... | 656 | ... | ... | 12 | ... | ... | 752 |
| March ... | 12 | ... | ... | 1,845 | 1,803 | 19 | 24 | ... | ... | 5,056 |
| April ... | 242 | 1,842. | 75 | 2,933 | 1,131 | ... | 38 | ... | 22 | 6,283 |
| May ... | 224 | 4,318 | 620 | 1,508 | 2,966 | 17 | 24 | ... | ... | 9,677 |
| June ... | 538 | 6,322 | ... | 2,989 | 936 | 34 | 48 | ... | ... | 10,867 |
| July ... | 799 | 6,417 | ... | 1,417 | 85 | 14 | ... | ... | ... | 8,732 |
| August ... | | | | | | | | | | |
| September ... | | | | | | | | | | |
| October ... | | | | | | | | | | |
| November ... | | | | | | | | | | |
| December ... | | | | | | | | | | |

J. M. SINCLAIR,

Chief Veterinary Surgeon.

# Farming Calendar.

## September.

### BEE-KEEPING.

This is an important month for the bee-keeper, as it starts the first flow of the season. All hives that were sent into winter quarters on a double brood chamber, or otherwise with ample food for that period, should now be overflowing with young in all stages and with a population large enough to take full advantage of the flow. All hives should be carefully examined now and again, entrances opened out to suit the advancing warmth of the weather, and where necessary ventilator lids replaced on the top crates under the hive lid. See that no worry is caused to the bees by ants getting up, and that ample stores of good water (with a pinch of salt and a dash of vinegar) are available for drinking purposes, of which bees consume quite a lot. Swarms can now be looked for; if not required, they can best be destroyed by carbon bisulphide or calcium cyanide—both requiring very careful handling. If it is wanted to increase the apiary, as soon as the scouts are seen looking round for a home, get the decoy hive ready filled with dummy and proper frames of full foundation sheets, or, better still, if they are available, old drawn out brood combs, and as soon as it is taken possession of, insert if possible a frame or two of unsealed brood. As a rule the swarm will settle down at once. Such a colony is best placed in the apiary the same evening, if it can be so arranged. Do not make the mistake so often seen of supplying the new colony with starter frames only; give them full foundation sheets; it pays every time, and more especially so in the first early honey flow. Be sure also and protect the apiary against that persistent robber, the honey bear or ratel, by fencing it with fowl netting and pegging that down with wooden pegs every two feet. The two-footed robber can be just as effectively dealt with by placing a small light chain round the entire hive fastened with small staples and a padlock.

### CITRUS FRUITS.

The fate of the citrus fruit crop is dependent upon the treatment the trees receive during this month. If the trees have been given the treatment recommended in the August calendar, and this treatment is followed by good irrigations and cultivation, a good crop of fruit can be expected, whereas a total failure may be the result if the trees suffer for want of moisture at this season of the year.

If not already done, all top worked trees should be headed back early in the month. This cutting back will induce the dormant buds (set in autumn) to commence growth. As the new shoots develop the old tops may be further shortened back until the old top is displaced with a new profitable one.

The packing of late varieties must be speeded up and completed by the end of the month if possible, as the late packed fruit is likely to deteriorate in quality or come into competition with Mediterranean fruits.

All adventitious shoots (water shoots and suckers) must be cut off as they appear, and this work should be continued throughout the growing season.

## CROPS.

Utilise your labour to the fullest extent for stumping and clearing more land for mixed crops and for general farm development. Do not be satisfied unless each year sees more profit-earning development work effected. Good organisation of the farm work will permit of much being done without great cost. Begin marking out holes for hand check-row planting of maize, and apply manure or fertiliser. Fertilisers which are to be broadcasted and ploughed or harrowed in can be applied. Do not forget that lands which have been green manured in March or April will require a second ploughing about this date or before being seeded to crops. Early varieties of winter cereals ripen this month and require harvesting. Danger from frost should be past now, and crops susceptible to frost, such as potatoes, onions in beds for the summer crop and Jerusalem artichokes, may be planted where lands are moist. Pumpkins and early maize may be planted on vlei lands. Edible canna may be planted "dry" during the latter half of this month, where some rains may be expected during next month. Overhaul all implements and replace worn parts. Putting this off till the planting season may mean serious loss of planting opportunities between rains. Get out the planters and seed drills. Overhaul and place in proper working order. Ploughing and cross-ploughing should be hurried on with; also the ploughing under of farmyard manure. A spiked roller can usefully be employed for breaking down clods, particularly on those lands which are to be planted first. Make every effort to secure as good a seed-bed as possible; good seed-beds mean good stands, and good stands are all-important in securing good yields.

## DAIRYING.

This is generally the quietest month of the year from a dairying standpoint. Most farmers have by this time exhausted their supplies of winter feed and the production of dairy products is consequently at its minimum. Town milk supplies are now falling off, and a greater use of purchased concentrates in the form of ground nut cake and bran is advisable to keep up the milk supply. Very little cheese is made during this month and stocks are naturally low. Old cheese should be cleared out of the storeroom before the advent of hot weather, and if possible should be sent to be stored under cold storage conditions. Considerable difficulty is to be expected in making butter during this month, as the early spring grass is shooting in the vleis and the butter is consequently very soft. To counteract this, greater use should be made of cotton seed cake, of which a small supply is expected to be available this season.

## DECIDUOUS FRUITS.

Newly planted trees must not be permitted to become too dry; watering by hand or gravitation must be continued until the rains commence. Ten gallons of water every fourteen days are sufficient for young trees; these applications should be followed by the loosening of the soil to prevent undue evaporation of the added moisture.

All undesirable growths on the stem and in the centre of the trees should be suppressed as they appear; this will enable the retained shoots to develop normally.

Early fruits must be thinned out this month; only retain two or three fruits on each bearing twig or shoot. Those that are left will then develop into large and attractive fruits.

## ENTOMOLOGICAL.

**Cotton.**—Prevention for most of the boll-worms will be the proper preparation of the ground, with thorough cultivation and eradication of all weeds on the land, particularly those of the family Hibiscus. Wild host plants for stainers should be sought out and destroyed.

**Tobacco.**—Young plants in seed-beds may suffer from cutworms. Frequent cultivation and laying down of poisoned bait—50 lbs. bran and

21 lbs. Paris green; bring to consistency of a stiff dough, adding water when necessary. Distribute this over the seed-beds in the forenoon, as the cutworm does most of its feeding at night. The beds should be thoroughly burnt over with wood or dry tobacco stalks to ensure that the seed-beds are free from cutworms, and baiting for any coming in from the surrounding ground should then be resorted to when the plants appear. Clear the ground for some distance round the beds, say 30 yards in all directions, and bait this ground thoroughly before sowing—this clearance allows a wide margin over which the cutworms would have to travel. Cutworms' moths are nocturnal in habit, so that the coverings of the beds need to be moth-proof at night; this should be seen to each evening.

Potato.—Early potatoes are liable to suffer from caterpillars. The crop should be sprayed at first sign of injury with an arsenical wash.

Cabbage.—During this month the most prominent enemies of plants of this family are diamond-back moth and web-worm. Cabbage louse is sometimes troublesome. The young plants may be sprayed or dusted with an arsenical compound for the former, and sprayed with tobacco wash and soap for the latter.

Beans.—Planted under irrigation during September usually escape serious infestation with stem maggot.

Citrus.—Throughout the month lime-sulphur spray (1-100) may be used to control yellow citrus thrip whilst on very young fruit. A useful spray against black aphis and thrip is the following:—Nicotine, 9 ozs.; Capex spreader, 7 ozs.; water, 100 gallons; Capex lime-sulphur, 1 gallon. This may be sprayed or fumigated against scale insects, having regard, however, to presence of fruit and blossom. Spraying and fumigating for scale should not be carried out whilst trees are in blossom. Clear young growth of aphis previous to blossoming, using nicotine, tobacco wash or Derris.

## FLOWER GARDEN.

Cultivate extensively to prevent evaporation and to keep weeds in check. Water plants newly set out, especially such as have their roots near the surface. Thin and regulate growing shoots on roses and various shrubs. Plant out cannas and chrysanthemums (for massing and border decorations) and other herbaceous plants.

## VEGETABLE GARDEN.

Sow French beans, leek, spinach, cucumber, egg plant, celery, rhubarb, melons and tomatoes. Small sowings of peas, turnips, beet, lettuce, radish, carrot, parsnip may be made now.

## FORESTRY.

All cuttings struck in sand in July and not yet transplanted into good soil should have this done as soon as possible. Tentative sowings of eucalypt seeds should now be made on a small scale, so that transplants will be ready in case the first half of the rainy season should prove favourable; otherwise, bulk sowings should be postponed to October-November.

## GENERAL.

Indigenous labour is apt to become more scarce at this time of the year, the boys returning to their kraals to break up the land for next season. Stock are liable to stray in search of the young grass now coming up, and much trouble from this cause is to be looked for on unfenced farms. Natives are now cultivating their gardens preparatory to sowing their crops, which they do much earlier than do Europeans. The mischief caused by veld burning becomes apparent from this time onwards in the condition of the stock, and it is necessary frequently to move them away in search of grazing.

## POULTRY.

The supply of green food to the birds must be kept up; in fact, during the hot weather they require more.

During our dry season the available supply of such green foods as lettuces, cabbages, sunflower leaves is much reduced, but there are many others that can be used, such as belhambra, plumbago, wild cockscomb, plantain leaves, paw-paw leaves, etc. Sprouted oats, barley and wheat should also be used. Many of the young cockerels should now be fit for killing. Keep the best and get rid of the remainder. It is very advisable to caponise all young cockerels when about 2½ lbs. weight. Bulletin No. 517 gives clear and concise details as to the method of performing the operation. Some of the earliest hatched young pullets will show signs of commencing to lay now. No light breed bird should lay until it is 5 to 5½ months old, or a heavy breed until it is 6 to 6½ months old. Should any show signs of commencing to lay before this, they should be moved from run to run to prevent their doing so. A bird that lays before it is fully matured will stop growing, will always be small, and its eggs will for its first year of laying also be small.

When the pullets are four months old, i.e., those of the light breeds, they should be put into their permanent laying quarters, and those of the heavy breeds when they are five months old. A bird that is moved after it has started to lay will stop and very probably go into a moult.

See that young ducklings get plenty of shade during the hot weather. Those destined for killing should not be allowed free range or even a medium-sized run, but should be kept fairly crowded in small runs. It is necessary to get the flesh on them as quickly as possible, and the more rest and less exercise they have, the more rapid will be the growth, and also more succulent and tender the flesh.

The hatching of turkeys should proceed rapidly and be carried on until the end of the dry season. See that they have plenty of chopped onions or onion tops or eschalots, and thick separated milk. These are absolutely necessary if the turkey breeder wishes to be successful with his rearing. Do not give wet food; dry mash such as given to chickens is the better.

## STOCK.

Cattle.—Ranching cattle should require little now in a normal season; it is only in the event of very late rains that trouble should be expected. Where possible, it will be wise to keep an eye on those cows that may be expected to calve early, with a view to feeding them if necessary, and seeing that they do not get too poor. The dairyman will carry on much as in August; he will, however, use his discretion (in accordance with the condition of his veld) as to the use of ensilage, pumpkins or other bulky and succulent food. He will be wise not to shorten the supply of concentrated foods for some time to come. A little hay or ensilage should still be kept in reserve until the rains have fallen in reasonable abundance.

Sheep.—The remarks for August apply. If spring lambs are expected, it will be wise to see that the sheep shed is in good order—clean, dry, properly drained and airy. Watch that the ewes shall not be poor when they lamb, and remember that they cannot rear good lambs if the veld is bad, but must have their grazing supplemented, just as milk cows are fed in order to produce milk.

## TOBACCO.

Hasten preparation of seed beds. Begin sowing seed beds each fortnight for the acreage proposed to be planted; fertilise and stimulate growth so as to be ready for planting out should rain come early in November.

## VETERINARY.

There should be very few deaths from redwater and gallsickness this month. Cases of vegetable poisoning of stock picking up tempting young green shoots of dangerous character on the burnt veld are of frequent occur-

rence. Sheep can be inoculated against blue tongue, but ewes in lamb should not be treated, on account of the danger of abortion. Scab may be prevalent.

### WEATHER.

The temperature may be expected to rise steadily during this month. Rains are not due until next month, though the average over a period of years shows slightly more than in the previous four months, and ranges between .1 and .5 inch. Frost has been known to occur in September, although this is a very unusual event. Rain-gauges should be seen to before the rains commence. They should be carefully adjusted to stand exactly level with the lip four feet above ground, and care should be taken that no tree, building or other obstruction interferes with the fair precipitation of rain into the orifice.

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# October.

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### BEE-KEEPING.

Bush bloom is now on, the queens consequently are laying vigorously, therefore give space and ventilation. In good districts, where stocks are strong, nectar may be coming in freely, and to prevent swarming it may be necessary to remove a crate of honey. By using the carbolic cloth, the operation is easily and quickly accomplished. At this season, whenever a crate of honey is removed, a properly fitted empty crate must take its place, otherwise the bees will swarm. Keep the apiary clear of weeds, and all hives well shaded. Feed any weak stocks.

### CITRUS FRUITS.

Citrus trees should not be permitted to suffer for want of water if a good setting of fruit is desired. Continue irrigation at fairly frequent intervals, especially if it is windy. Cultivation must follow each irrigation when the soil is fit to work, otherwise a large amount of moisture will be lost by evaporation. The packing of late fruit for export should be completed early in the month or before the rains commence. If rains intervene, the carrying properties will be affected and the fruit will probably break down in transit. Suppress all stem growths or water shoots as they appear. Young trees planted last season may with advantage have the stems whitewashed or washed with Bordeaux mixture paste; this will prevent undue sun-scalding of the unprotected stems. Plant cover crops with the first good rains.

### CROPS.

If not already attended to, overhaul all farming implements and replace worn parts to ensure efficiency. Shell ground nuts required for the season's planting. Ploughing of old lands should, at latest, be finished this month. If seed potatoes will not keep in good condition until next month, they may be planted now, but later planting is better. Edible canna may be planted this month before rain falls. Also velvet beans, dolichos beans and sunn hemp towards the end of the month for green manuring. Harvest winter cereals and plough under the stubbles as soon as possible after harvest. When rains have fallen, use every effort to improve the tilth of the lands which will be the first to be planted. On cloddy lands already ploughed, seize the opportunity to break down the clods by disc and drag harrowing as showers of rain fall. A spiked roller is very useful for this work. A good tilth means good planting, and a good stand of maize; therefore, do everything possible by cross ploughing, disc and drag harrowing to bring the soil into good condition for seeding.

When necessary, keep the harrows going to check early weed growth. Clean lands at this time of year are an insurance against cutworm and other insect pests. If weather conditions permit, plant a trap crop of maize to attract the stalk borer. New land to be ploughed and intended for planting this season should be cleared of heavy grass or weeds by burning or cutting to ensure good work being done by the ploughs. Seasonal showers of rain are liable to spoil bricks unburned. See that bricks which have been made are protected from rain. Clean out guttering and down-spouts of house and farm buildings. Press on with development work so as to have this completed before rains break.

## DAIRYING.

During the month of October and until such time as the rains have commenced and green grazing is available, dairy stock require to be almost entirely stall fed. Cows in milk and cows due to calve should be liberally fed on succulents and concentrates in order that they may commence the dairying season in good condition, and make full use of the early grazing for milk production. Dairy cows that are underfed at this time of the year invariably produce milk of poor quality, and usually throw weedy undersized calves; furthermore, they do not pick up in condition until comparatively late in the season.

During October, the cow's ration should consist of succulents such as silage or green feed, etc., legume hay of good quality and a liberal allowance of concentrates; a pound or so of a feed such as ground-nut cake is invaluable for dairy stock at this time of the year.

Weather conditions are generally fairly warm during the month of October, and every precaution should be taken to keep the cream, which is used for butter-making or which is sent to the creamery, as cool as possible. The can or bucket containing the cream should be placed in a basin of water or concrete trough, in the dairy, and exposed to a draught; a piece of kaffir blanket, which dips into the water, should be wrapped around the can or bucket containing the cream. Churning of cream for butter-making is best carried out early in the morning—before sunrise if possible; the coolest water obtainable should be used for washing the butter whilst in the granular stage.

At this season of the year cheese-makers may find that the milk is deficient in butter fat; this is generally the result of under-feeding or unsuitable feeding. Cheese made from milk of low fat content is invariably dry and hard, defects that are accentuated by over cooking the curd or by cooking at too high a temperature. The curd should be firmed in the whey at a temperature not higher than 98° F. to 100° F.

## DECIDUOUS FRUITS.

Keep all trees well watered until the rains commence; cultivate after each watering to prevent evaporation of added moisture. Rub off all undesirable shoots, such as those arising on the main stem near the ground; also those shoots having a tendency to crowd each other. Two or more shoots should not be allowed to develop from the same spot on any part of the tree. Rub off the undesirable ones soon after they appear. The fruit of early peach trees should be thinned out if a heavy crop has set; this thinning will result in a crop of large-sized fruit. All fruit should be thinned out if necessary.

## ENTOMOLOGICAL.

Maize.—Where circumstances permit early growth of maize, crops planted late in October are liable to suffer in December from stalk-borer, especially if only a few acres are involved. If maize can be planted early in October, the plants are usually large enough by December to outgrow serious damage. Maize beetle is now in its pupal stage. Thorough working and smashing up of the soil at this time will destroy great numbers.

Tobacco.—See notes for last month, together with article in the "Rhodesia Agricultural Journal" for October, 1926, on "Baiting of Tobacco Seed Beds with Cyanogas Calcium Cyanide." The lands must be kept free from all weeds which caterpillars may feed on, and it is well not to have maize lands, tomato and Cape gooseberries near the lands; a clearing of some depth is advisable, which must be regularly weeded. If poisoned bait is put down, it has been found that a covering of sacking or leaves will help to retain moisture and thus give further attraction, especially at this time of the year. In order to lessen the heavy infestation of caterpillars and other insect pests in the seed beds, coverings of hessian or cheese cloth should be kept over beds, especially at night; cutworm moths are nocturnal in habit, so that the coverings of the beds need to be moth-proof at night. Notwithstanding precautions in the covering of the beds, insects will enter, and after the emergence of the seedlings a weekly spraying should be carried out. Lead arsenate at the rate of 1½ ozs. (powder) or 3 ozs. (paste) in a 4-gallon petrol tin can be sprayed on the plants once a week to keep insect pests in check. Lead arsenate can be safely used with Bordeaux mixture, the mixture not reacting upon one another. The two combined sprays act as a preventative and deterrent to insect and fungoid troubles.

Cotton.—Thorough cultivation and keeping down of weeds should be resorted to in order to lessen the infestation of over-wintering pupæ, by exposure to the sun, and birds.

Potato.—Avoid introducing root gallworm and potato diseases to valuable land under irrigation or to the home garden with seed potatoes. Growing plants in October may be defoliated by caterpillars, or the tops severely injured by the potato tuber moth. Spray with arsenate of lead (powder), 1 lb. to 30 gallons of water; or (paste), 1 lb. to 16 gallons of water.

Cabbage, Turnip, etc., are apt to suffer severely from diamond back moth and webworm. Dust regularly with Paris green, 1 lb.; fresh water-slaked lime, 20 lbs. For cabbage aphis, water liberally, and wash plants regularly with a forceful stream of water from a hose or spray pump.

Beans and Peas are little attacked by insects at this time of year. If aphis (green fly) is troublesome, the plants may be sprayed with soap wash or tobacco wash. Leaf-eating beetles are best destroyed by hand.

Cucumbers, Marrows, etc., may be attacked by leaf-eating beetles, which quickly destroy the young plants. The young plants may be protected by gauze covers. Once vigorous growth has started, the damage is negligible.

Citrus.—All out-of-season fruit should be removed by this time. Destroy all fruit "struck" by the false codling moth. Aphis may be controlled by very careful spraying with the combined "Lime-Sulphur-Nicotine" spray (for details see "Rhodesia Agricultural Journal," Sept., 1926, page 871), while the yellow thrip may also be kept in check by this spray. Avoid using miscible oils for citrus spraying. A careful search should be made for the American bollworm ("Heliothis obsoleta"), and the Chief Entomologist should be immediately informed should this pest be found.

Deciduous Fruit Trees, including grape vines, are liable to attack by chafer beetles. Heavy spraying with lead arsenate (paste), 1 lb. to 10 gallons of water, or (powder), 1 lb. to 20 gallons, appears to afford considerable protection, but the leaves need thoroughly coating.

Fig.—Fruit infested with fig weevil should be collected regularly and destroyed.

## FLOWER GARDEN.

All flower seeds, annual and perennial, may be sown as in September. A word or two on open seed beds may not be out of place here. These beds should be prepared in a sheltered position, and the soil should be well and deeply dug. This is most essential, as in this state the soil

when once watered is more easily kept moist, and is not so liable to cake. The top dressing should be free from all undecayed vegetable matter, and when sown, the seeds should be covered with a thin dressing of fine light soil, over which a thin covering of grass may be placed to check evaporation. Transplanting from boxes or beds should be done on a dull day or towards evening; the plants should be well watered before being removed, and the roots disturbed as little as possible, care being taken that the latter have their full depth and spread when planting.

## VEGETABLE GARDEN.

As in September, nearly all vegetable seeds may be sown. Early potatoes should be earthed up when reaching the height of about eight inches. In planting a small amount of marrow, melon, cucumber, and pumpkin, the writer has found it economical to sow the seed one in a tin and transplant when about four inches high in hills. A few cucumbers planted in this manner yielded nearly 400 a week for about two months. Sweet corn and maize may also be sown this month.

## FORESTRY.

The main sowings of Eucalypt (gum) seed should be made either in seed trays or in well prepared seed beds. A well-broken soil forming a fine tilth in the seed bed ensures more successful germination and better plants. If transplants are being used, any seedlings which are ready should be pricked out.

Seedlings in open beds may have their tap roots cut so as to develop fibrous lateral roots, and thus produce good type stocky plants. Remember the plant feeds through its roots, hence the better the root system, the healthier the plant and the greater its chances of successful establishment. If conditions are favourable, cross-plough and harrow land for planting broken up in early autumn.

## POULTRY.

October is usually a hot month, and poultry keepers should therefore see that their birds have access to shade during the day. At the same time they should have plenty of air. One often sees birds during hot weather sitting under dense bushes, which is almost worse than no shade at all.

All houses should be examined and, if necessary, repaired. It is advisable to repeat the caution that birds must have dry quarters.

Many poultry keepers do not realise the vital necessity of giving their birds especially the young stock, plenty of succulent green food during the hot weather. It should be cut up and placed in boxes or hoppers about 7.30 a.m. and 5 p.m., and, if very hot, also at noon; it should never be placed in the sun. As much as the birds will eat should be supplied. Lack of it, especially during hot weather, causes a reduced output of eggs, smaller eggs and light-coloured yolks; further, a disease known as "nutritional disease" is likely to affect the birds and cause deaths. The symptoms are much like those of eye roup, without the well-known offensive smell of roup. It is due to the fact that vitamine A, which is present in large amounts in all succulent green foods, and which is so necessary for nutrition, is lacking. There is no doubt that many chickens and fowls die each year from this cause.

Ducks.—These during the hot weather require even more shade than do fowls: they cannot stand the direct rays of the sun nor sultry heat. The houses should always have dry floors, and should be overhauled before the rains commence. Ducks sleeping on damp floors often contract rheumatism and cramp. The floor of the duck house should be raised a few inches, thus ensuring a dry bed

As many ducklings should be hatched as possible now, provided, of course, there is the prospect of a sale for them at ten weeks old. They thrive best in the wet weather.

Turkeys.—Stop hatching until after the wet season is over. To rear turkeys in the wet weather entails a good deal of time, labour, expense and often losses. Once a young turkey chick gets wet, it will probably die; at any rate it will never be the same bird it would have been had it not got wet. Give the older turkeys all the range possible; the further afield they go, the better grown birds they become, and less is the expense of feeding. See also that their roosting quarters are water-tight before the rains commence.

## STOCK.

Cattle.—Ranching cattle on granite veld will in many instances be in fairly good condition on account of the early grass in the vleis, etc. On the diorite soils and later veld the cattle owner will still have to watch his weaker cattle carefully. In any case all supplies of hay, ensilage, majordas, etc., should be carefully husbanded in anticipation of possible late rains, but at the same time every effort should be made to prevent cattle becoming weak. Dairymen will need to feed highly both with succulents and green foods. Calves should be weaned and branded, if this has not already been done, and care should be taken that they do not suffer any serious set-back by reason of the want of veld. If calves are not desired in mid-winter, the bulls should be taken out of the herd now until the end of January. Care should be taken to provide a plentiful supply of clean water, and dipping must be regularly attended to.

Sheep.—If spring lambs are expected, one should see that the sheep shed is in order, and that there is a supply of hay, ensilage or mealies for the poorer ewes in the case of late rains. All drinking places should be cleaned out, and care taken that the water supply is sufficient.

## TOBACCO.

Continue to sow seed beds. Where grass has been put on the seed beds to assist germination of seed a daily inspection should be made, and as soon as the first few plants make their appearance the grass should be raised up a little from the bed in order to prevent the plants growing "spindley." All possible preparation for the coming planting season should be made.

## VETERINARY.

White scour is prevalent in spring—November and December—but dipping is eradicating this disease. There is still danger from vegetable poisoning, and it will only disappear when there is plenty of good grass on the veld.

## WEATHER.

This is apt to be a hot, dry month, and rather trying, therefore, to man and beast, and the strong winds which blow at this season add to the general discomfort. Evaporation is, as a consequence, at its greatest at this time of year, and dams and pools lose most from this cause. The prevalence of veld fires at this time of year adds to the anxiety of the stock owner.

The rainy season has occasionally started early in October, but for practical purposes it need not be expected before the end of this month. The days are becoming warmer, and often even hot and oppressive. Clouds gradually collect, at first disappearing at sunset, but later becoming more persistent. Sheet lightning is usually frequent, and showers of gradually increasing severity mark that the rainy season has set in. Steps should be taken in advance to provide for the run-off after such torrential rains, otherwise serious loss may result.

The normal rainfall varies from three-quarters of an inch to an inch in the different portions of the country. The rain usually occurs in the form of thunder-showers, which are not long sustained and are fairly local, but the total rainfall experienced during the month does not vary much over the whole country, with the exception of the eastern border, where the rainfall is usually heavier.

# Seeds for Sale, Gwebi Farm.

| | | s. | d. |
|---|---|---|---|
| Salisbury White Maize ... ... ... ... ... ... ... ... | 100 lbs. | 21 | 0 |
| Salisbury White Maize, Tips and Butts, per bag of | 200 lbs. | 17 | 0 |
| Kherson Oats ... ... ... ... ... ... ... ... ... ... ... | 100 lbs. | 26 | 0 |
| Kinvarra Oats ... ... ... ... ... ... ... ... ... ... ... | 100 lbs. | 26 | 0 |
| Ground Nuts (Spanish Bunch in shell) ... ... | 75 lbs. | 18 | 3 |
| Linseed (Flax J.W.S.) ... ... ... ... ... ... ... ... ... | per lb. | 0 | 6 |
| Boer Manna ... ... ... ... ... ... ... ... ... ... ... ... | per lb. | 0 | 4 |
| Majorda Seed ... ... ... ... ... ... ... ... ... ... ... | per lb. | 1 | 1 |
| Sunflower Seed (Large Black) ... ... ... ... | 100 lbs. | 16 | 0 |
| Sunflower Seed (Small Black) ... ... ... ... | 100 lbs. | 16 | 0 |
| Sweet Potato Tubers (Calabash Leaf) ... ... (Available August and September.) | 150 lbs. | 11 | 0 |
| Sweet Potato Slips ... ... ... ... ... ... ... ... ... | per bag | 6 | 0 |
| Napier Fodder Roots ... ... ... ... ... ... ... ... | per bag | 6 | 0 |
| Seed Potatoes ("Up-to-date," limited supply), | 150 lbs. | 21 | 0 |
| Edible Canna ... ... ... ... ... ... ... | per 100 "tubers" | 9 | 0 |

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

# Notes from the "Gazette."

| *"Gazette" Date.* | *Items.* |
|---|---|
| | HEARTWATER. |
| 26.7.29. | The movement of cattle, sheep or goats is prohibited from the following areas unless they are free from bont tick (*Amblyomma hebræum* and *variegatum*) :—<br>1. The Gwanda native district.<br>2. The Chibi native district.<br>3. The Belingwe native district, excluding that portion lying north of the Belingwe Reserve.<br>4. That portion of the Bulalima-Mangwe native district lying south and including Raditladi Reserve, farm Romney and Reserve, Mphoeng's Reserve, farms Lewisdale, Thornville and Lion's Park.<br>5. In the Nyamandhlovu native district, the Gwaai Reserve, the farm Gutamegwa and unalienated land.<br>6. That portion of the Bubi native district lying west and north of the farms Westland Row, Bembezaan, Westgate, Molecomb, Goodwood Block, Gourlay's Block, Crescens Bubi Block and Kenilworth Block.<br>7. The Wankie native district.<br>8. That portion of the Matobo native district including and lying south of the Shashani Native Reserve, Stutterlingen, Pudzo, Dope, Inkonyana, Reserve. (G.N. 439.) |
| | AFRICAN COAST FEVER. |
| 26.7.29. | Government Notice No. 441 adds Wolfscrag to the area of infection in the Melsetter district and the following farms to the guard area :—Vermont, Wolverhampton, Helvetia, Chibuzana, Ratelshoek, Smithfield and Flenters |

# Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

## AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 616. The Ground Nut or Monkey Nut, by C. Mainwaring.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.

No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.
No. 684. Warning to Maize Growers : Maize for Export.
No. 685. Notes on Farm Practices at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Orrdinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
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Land Bank Act (price 1/-).
Twelve Simple Rules for the Avoidance of Malaria and Blackwater.

Field of Kinvarra oats grown as a summer crop at Messrs. Lamont Bros.' farm, Ardlamont, Headlands.

THE RHODESIA

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## Editorial.

*Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.*

**Kinvarra Oats as a Summer Crop.**—Messrs. Lamont Bros., Ardlamont, Headlands, send us the accompanying photograph of a field of Kinvarra oats grown on their farm during the rainy season of 1928-29, with the information that the yield of grain was at the rate of six bags an acre. The sample of these oats which Messrs. Lamont Bros. submitted with their letter was of excellent quality.

This photograph is of interest by reason of the fact that over a period of years none of the Kinvarra selections has given very satisfactory results at the Salisbury Experiment Station, although they have done well elsewhere. Good results have been obtained on the experimental plots with Kherson oats and better results still with S.E.S. oats, named after the Salisbury Experiment Station. This oat has

been evolved from rust-free selections of Burt oats and is a very robust variety, often attaining a height of over 5 feet on fertile land. Neither the Kinvarra nor the Kherson variety is completely immune from rust, but when they are grown on suitable land they are sufficiently robust to be able to resist its attacks and to give profitable crops in seasons of normal rainfall. In droughty seasons the Kherson variety appears to be the more reliable. As was stated in the annual report of the Agricultural Experiment Station, Salisbury, the concluding portion of which appeared in the July issue of the Journal, trials with these selections are not yet concluded, but the seed of some of them has been bulked and sent to the Gwebi farm for further trial and multiplication. A limited quantity of this partially improved seed will be available for distribution to farmers for sowing this season. Intending growers should note that oats prefer fertile soil and respond well to dressings of kraal manure applied to a previous crop. Under dry land conditions the best time for sowing the grain crop is from the middle of December to the first week in January. If a fodder crop is required the best results are obtained when the seed is sown before the middle of January, but sowings may continue as late as the middle of February, with fairly satisfactory results if the season is a favourable one.

By correctly timed successive sowings of suitable varieties, and where irrigation can be practised or wet vleis utilised during the "dry" part of the season, these new selections make it possible to maintain a continuous supply of luscious green oat fodder during the greater part of the year. Low-lying land, which is too wet for maize, is found to produce good crops of oats. During the past season, on the sand veld experiment plots at Gwelo an excellent oat crop was produced, while, owing to "wet feet," the maize crop was rather a poor one.

Another kind of oat which promises to be of value to poultry farmers in particular is the hull-less variety, which is now being tried out at the Salisbury Experiment Station. The grain of locally grown summer oats is considered to be of little value for feeding to any class of stock, because of the high proportion of husk it contains. Many deaths among fowls have been reported through "oats of this kind becoming lodged in their throats." The kernels of this new

variety are ejected from their hulls or husks during threshing operations, so that when the product is winnowed the oat kernels are left entirely free of the harmful hull and resemble somewhat the grains of rye or thin wheat. This hull-less grain is believed to be eminently suitable for poultry of all ages and for other young live stock. Having thriven satisfactorily during the past two summers at the Salisbury Experiment Station, it is hoped that it may prove a satisfactory crop for general summer cultivation. Although the grain is not so large or as plump as that of the Sussex and New Zealand oats, it is believed that the new variety will rival those famous kinds in feed value because of the entire absence of the useless husk.

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**Appointment of Assistant Dairy Expert.**—Provision having been made in the Estimates for the appointment of an additional Assistant Dairy Expert, Mr. F. A. Lammas, of Aliwal North, has been appointed to the post. Mr. Lammas has had a long experience in creamery work, and in view of the impending necessity for the export of butter, it is hoped that this appointment will be instrumental in raising the standard of Rhodesian dairy products, so that they can compete successfully on the overseas market with those from more firmly established sources of supply.

Without, however, the co-operation of farmers in producing a better grade cream, the efforts of the Dairy Division are likely to be ineffective. Every help will be afforded to cream producers to improve their methods, and it is hoped that they will respond freely to the advice given to them by the officers of the Department.

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**Rhodesian Cattle in England.**—We have been supplied by Mr. C. C. Macarthur with the sales account of his cattle which formed part of the consignment of 320 head shipped to Birkenhead per s.s. Hyacinthus from Capetown on the 26th May last. Other consignors were: Mr. A. L. Millar, with 11 head; Mr. Wheeler, 11 head; Messrs. Newmarch and McLean, 21 head; Mr. D. Black, 30 head; Mr. J. R. Stewart,

103 head; Gwebi Farm, 20 head; Matopo Farm, 2 head; and Liebig's Extract of Meat Co., 100 head. In giving some particulars of the sale of Mr. Macarthur's cattle, which incidentally fetched top price, it will be possible to estimate the financial results of the undertaking as a whole.

Mr. Macarthur's ten Shorthorn steers weighed on despatch from Rhodesia an average of 1,328 lbs. The dead weight is given in England as 699 lbs., so that the cattle dressed at 52.6 per cent. of the live weight as recorded in Rhodesia. The amount realised in England, after deducting various incidental charges amounting to £29 17s. 9d., was £228 13s. 11d. Railage less the rebate cost £14 8s. 2d., plus £2 14s. 2d. incurred during the journey to Capetown, and freight £120 8s. 9d. Thus the net realisation by Mr. Macarthur was £91 2s. 10d., or an average of £9 2s. 3d. per head. To this must be added the bounty of ½d. per lb. granted by the Government, so that Mr. Macarthur actually received £11 17s. 7d. per head for his cattle. Mr. Macarthur has not furnished us with his feeding costs, so we are unable to state what margin of profit is represented by the sale.

The result of the shipment is disappointing. A special effort was made this year to land the cattle in England before the Home cattle came off the grass, and although this was effected, prices are less than those realised in 1928, when the consignment was not landed until July. We understand that the animals this year lost weight and condition during the voyage and that this is the reason for the reduced prices. Why they should have done so we do not know, for according to advices received the cattle last year arrived in excellent condition. No doubt the matter will be investigated with a view to preventing a recurrence.

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**Pasture Research.**—We reproduce elsewhere in this issue of the Journal a paper read by Mr. A. D. Husband, Chief Chemist, at the meeting of the British Association at Pretoria, 2nd August, on the mineral aspects of pasture nutrition in relation to the live stock industry. As readers are aware, this subject has recently come into considerable prominence among scientific investigators, and research is

at present proceeding in many parts of the Empire, including Southern Rhodesia. The subject was introduced by Major Walter Elliott, chairman of the Research Grant Committee of the Empire Marketing Board, who gave a general review of the economic importance of research into this problem and described some of the results. Major Elliott not only instanced the importance of the study of the mineral elements in animal nutrition, but also gave some interesting data showing the correlation between the mineral content of the diet and the incidence of disease among two native tribes in Kenya Colony. The beneficial effect of the higher mineral diet was just as marked in the case of natives as has been found in the nutrition of animals. Mr. Husband's contribution followed, and it is interesting to note that he was deputed by the Rowett Institute, Aberdeen, to speak on the chemical aspects of this subject.

A valuable contribution to the debate was that of Dr. P. J. du Toit, Director of Veterinary Education and Research at Onderstepoort Laboratories, who gave some interesting figures showing the influence on the live weight and productive capacity of farm animals fed with bone meal or phosphate of lime as compared with control animals receiving no mineral supplement.

The subject presents many aspects and opens up a very wide field of investigation. It is gratifying to note that the small experiment carried out during the past two years at the Agricultural Experiment Station, Salisbury, has added to the available data on the subject. One important point brought out in this work is of great practical importance to every farmer in this Colony. We refer to the influence of the time of cutting grass on the quality of the hay produced. The Chief Chemist has demonstrated a fact to which attention has constantly been directed by the Agriculturists, namely, that there is a very rapid fall in the mineral content and the feeding value of grass cut after the end of the rainy season, and that one ton of hay made in March or early April has at least twice the feeding value of the same amount of hay made in May.

As we have previously mentioned, further investigational work, aided by a grant from the Empire Marketing

Board, will be continued on a more comprehensive scale this coming season, and we have no doubt that valuable data will be acquired.

# Boring Regulations.

The *Government Gazette* of 20th September contains new regulations governing the hire of Government drills. The main alteration from the previous regulations is to the effect that advances from Irrigation Loan Funds are now procurable for the repayment of boring charges. These loans are repayable over a period of years, the maximum being fifteen years.

# Notes from the Veterinary Laboratory.

By Ll. E. W. Bevan, M.R.C.V.S.,
Director of Veterinary Research, Southern Rhodesia.

"One hundred million a year is spent on imported meat: keep the money in the Empire."
Empire Marketing Board's Poster.

*(We feel sure that readers will welcome the re-appearance of these notes, which were at one time a regular and valuable feature of this Journal. Mr. Bevan deals with a variety of subjects in his contribution and presents his views in language which cannot be misunderstood. His remarks on "poverty" and contributory causes thereto open up a new field of investigation and are likely to prove of great practical value in maintaining the health of cattle. The future of the cattle industry of this Colony must depend for a good many years on the results achieved at the Veterinary Laboratory, and farmers will appreciate the fact that the officer in charge of this important work has taken them into his confidence in the discussion of problems which confront them. We are convinced that nothing but good will result from such a policy.—Ed., R.A.J.)*

**The Cattle Industry.**—The prospect of improved prices for cattle has come as a "silver lining" to the cloud of depression occasioned by the temporary failure of tobacco and other branches of the agricultural industry, and the growing world shortage of meat would appear to indicate

that such improvement may be permanent. It behoves us in Rhodesia, therefore, to put our "house in order" if we wish to participate in the good time which reliable authorities assure us is coming. For world's markets are conservative and exacting and not captured by inferior goods or even by samples of superior articles if there is not sufficient quantity behind the quality offered.

A meat boom might catch this country unprepared, for it has to be admitted that at present we have neither the quantity nor the quality to maintain a steady position in a market, even if we secured it. The good start made in 1911 and 1912 to improve our local stock has not been maintained; the Great War prevented the importation of well-bred stock, and after that the constant outbreaks of foot and mouth disease in Great Britain rendered it impossible to obtain the animals we so badly needed. In addition, owing to the "slump," cattle became a liability rather than an asset, and the sale and spaying of cows depleted our breeding stock. To-day we find many of our herds in a worse condition than fifteen years ago, and where an effort has been made to maintain the improvement of better-bred stock, lack of size and constitutional vigour has resulted.

But "sweet are the uses of adversity," and it is probable that many a valuable lesson has been learnt during the past few years which may be put to good advantage in the future. It is in the general interest that such experiences should be placed at the disposal of those who may profit by them, and it is for this reason that the veterinary notes which for some time have been neglected are again contributed.

**Poverty.**—Every year an enormous number of animals suffer and die from a disease which is generally described as "poverty." An examination of official records would probably reveal the fact that this is the principal cause of death in this Colony. To the veterinarian it suggests many things, some of which would not be regarded as complimentary to stockmen. For example, the term is less damning than "starvation," which rightly or wrongly might be attributed to a lack of foresight or generosity on the part of the owner. Too often the annual period of winter drought is forgotten in the luxuriance of the summer. The drying rivulets converted into muddy and stagnant pools, the

countryside blackened by veld fires, the coarse and useless grasses are forgotten when the country is fresh from the rains. Too often it happens that the stocking of a farm is based upon its carrying capacity during the summer; and in the winter there is a serious shortage of food.

Too often no water supply is provided, and cattle already starving and exhausted have to trek from one muddy pool to another to find the most essential element of life and health. It is not surprising then to find so many die of "poverty," and so many which survive stunted in growth and slow to respond even to better things when the days of plenty return. There is an old saying relating to stock, "Get them going and keep them going"; in other words, if profit is to be made, there should be no "set-back" in an animal's growth and development. The greatest growth in the shortest possible time is the object to be aimed at. But when animals are allowed to starve for four months out of twelve, not only is the progress made during the previous eight curtailed, but an appreciable amount of the succeeding eight lost in making good the previous wastage. There are some who claim that it is only by large numbers that stock-raising can be made to pay, and it is possible that in some exceptional areas this may be the case, but it is not a doctrine which can be commended. To-day in this Colony, as elsewhere, stock owners are commencing to fall into two categories, "breeders" and "feeders," and the latter will soon realise that it is a waste of time and money to endeavour to feed an animal whose frame and constitution have been impaired by a previous "set-back."

While "poverty," therefore, is generally the result of neglect, there are undoubtedly contributing causes. For example, it has been observed that animals may sometimes have available what appears to be an abundance of food, yet make no "headway" and even lose condition. This may be due to some mineral or other deficiency. Experiments about to be undertaken by the Chemistry Branch of the Agricultural Department may explain this apparent anomaly.

**Parasitic Gastritis.**—Another frequent cause, or contributing cause, of poverty is parasitic gastritis, which, there is reason to believe, is far more prevalent than is

generally recognised. In the dry season cattle are frequently dependent upon muddy and stagnant pools for their water supply, and these offer ideal conditions for the perpetuation and propagation of verminous diseases. Infected animals contaminate such places, and cattle crowding around them for food and water become infected and in turn disseminate infection.

Unfortunately, unless the disease is suspected and unless the particular position in the animal in which the worm is to be found is known, the true cause may be overlooked. The common worm which causes the disease is the same as that in sheep, namely, the "wire-worm" or *Hæmonchus contortus*, so named because of the twisted arrangement of its internal organs. This is met with in the fourth stomach, sometimes in such enormous numbers that the whole of the stomach contents of an animal recently dead may appear to be moving. Sometimes, however, it is not so numerous, and, being comparatively small—the adults only measuring from ¾ inch to 1¼ inches in length—it may be overlooked. A simple method of ascertaining whether worms are present is to draw a needle through the stomach contents, when worms may be found adhering to it. Another method of demonstrating the presence of this worm is to place a little of the dung of a suspected animal in a jam jar, which should be kept in a dark place. After four or five days, if moisture is present, the larvæ of the worm hatch out and may form what has been described as "a white slimy tract" on the inner surface of the jar. The larvæ are very minute and the film is composed of accumulations of them; but individuals are within the limits of visibility, and may be detected by their movements if the jar is held in a suitable light. A single demonstration will render a stockman familiar with the appearance of the larvæ and competent to carry out the test.

It is not proposed to describe too minutely the life cycle of the wire-worm, which is somewhat complicated, but the following details are of practical importance. The adult worms, male and female, persist for a long time—possibly as long as a year—in the fourth stomach of the infected animals. Here they subsist on the animal's blood, cause irritation and interfere with digestion. Possibly they also

Champion ox at Bulawayo and Salisbury Shows, 1929. Shown by Lochard Ranch.

Best pen of five slaughter oxen at Bulawayo Show, 1929. Shown by Lochard Ranch.

secrete a toxin or poison. They thus give rise to general unthriftiness, anæmia and poor condition.

The females when fertilised lay innumerable eggs, which pass out with the fæces. These are almost constantly present in the dung of an infected animal, and if deposited under favourable conditions of temperature and moisture, a minute larval worm develops in them, which may hatch out within twenty-four hours. The young worm now passes through two stages, neither of which is infective if swallowed by the animal; it is only in the third stage that, having made its way into the stomach, it can become established there. In the third or infective stage the larva is enclosed in two skins which act as a sheath and protect it against extremes of heat and cold. Moisture and absence of sunlight are favourable to it, and under suitable conditions it can live for over a year outside the animal body.

Under the influence of strong light it retreats into damp soil, where it can remain for long periods until favourable conditions again arise, when it can make its way in the moisture of the soil or grasses which it climbs to be taken up by animals grazing upon them. Once in the fourth stomach, the protective sheath is lost and the young worm passes through the third and fourth larval stages and develops into the mature worm.

The time which elapses between the swallowing of the infective larval worm by the sheep and the laying of eggs is about a month, a fact which suggests the principles of treatment, which will be discussed later.

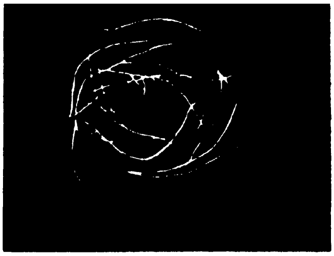
It is in the fourth or true stomach, the *Abomasum*, that the wire-worm is met with, but the position of this is not commonly known, and it may be well to give a few particulars to enable the uninitiated to locate it. The stomach of ruminants is so constructed that large quantities of dry, fibrous food can be swallowed and stored until the opportunity arises for the digestive processes to be completed. In order that this may take place it is generally of enormous size and divided into four separate pouches, which are regarded as so many stomachs. The first of these is the *rumen* or *paunch*, which in the ox fills the greater part of the abdominal cavity and may contain as much as fifty gallons of food. This food, having undergone fermentation, is

returned in the form of a bolus to the mouth to be re-masticated. This is known as "chewing the cud."

The bolus when masticated is again swallowed and makes its way to the second compartment or *reticulum*, which is very much smaller than the *rumen* with which it communicates. Its internal surface is divided by ridges into a honeycomb arrangement, and constitutes the so-called "tripe" beloved of invalids. The *reticulum* communicates with the next compartment, the *omasum*, by means of a prolongation of the œsophagus, known as the "œsophageal groove." The *omasum* is also known as the *Psalterium* or *Bible-stomach* because of the leaf-like arrangement of its lining. Between these leaves the food is pressed and is generally somewhat dry, so that the third compartment can be detected as a hard ball situated well forward against the diaphragm. *It is a useful guide and assists in the finding of the true stomach or Abomasum* into which it opens. This is a large elongated compartment situated on the right and upper side of the paunch. In a dead animal lying on its back, the abdominal wall having been removed, it will be found beneath the paunch, which has to be pushed to one side to enable it to be examined. This is better understood by reference to the diagram.

The lining of this stomach differs from that of the previous three compartments, being in numerous soft folds, which are of a pinkish colour and contain the glands from which the gastric juices are secreted. It is in this stomach that the digestive processes take place before food is passed on to the small intestine, and it is in the semi-fluid contents that the wire-worms may be found. The position of this stomach should be known, because several poisons, including arsenic, are best detected by analysis of its contents.

It might be regarded as unpractical to suggest that parasitic gastritis might be prevented by avoiding stagnant and muddy pools and providing a supply of water from wells or boreholes or by shifting animals from pastures likely to be infected. Pasture rotation has been advocated for sheep, but could rarely be carried out in the case of cattle. Medicinal treatment, therefore, has to be relied upon, and fortunately the so-called "wire-worm remedy" so successful in sheep can also be applied to cattle with equally beneficial



WIREWORM. H. CONTORTUS
NATURAL SIZE

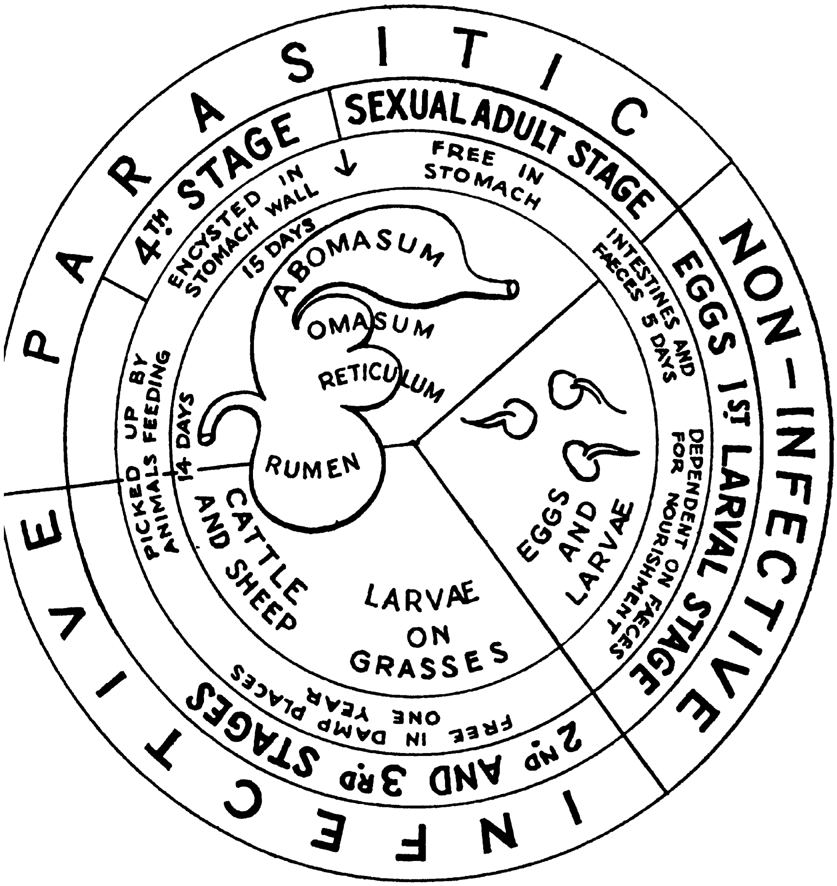



DIAGRAM SHOWING DEVELOPMENT
OF THE WIREWORM. H. CONTORTUS

results. Recent observations at the laboratory upon certain "fly-struck" cattle which were also found to be infected with wire-worm demonstrated its efficacy. For this purpose the powder supplied by the Division of Veterinary Services, Department of Agriculture, Union of South Africa, was employed as nearly as possible in the dose advocated—that is, "one five-notch spoon of powder for every 100 lbs. body weight." It was found that a level five-notch spoonful weighed about ½ gramme and that a level small teaspoonful weighed between 2½ and 3 grammes. Neither the weight of the oxen nor the contents of the spoon could be gauged quite exactly, but it was found that if an approximately accurate dose was administered no ill effects occurred. It is said that the preliminary starvation when treating sheep is unnecessary when dosing cattle, but the animals treated at the laboratory were brought into a bare paddock at about 4 p.m. one evening and were kept from food and water until 10 a.m. the next morning, when they were treated by placing the appropriate dose of dry powder into the mouth. They were then given a supply of hay, but water was withheld until 4 p.m. of the same day. Almost immediately after treatment the animals commenced to feed, and did not at any time appear to suffer any discomfort or ill effects. The dose was repeated after a fortnight and a third dose was given a month after the second. *Post-mortem* examination of the stomachs of three of them made shortly after the final treatment failed to detect any worms.

The administration of the dry powder as described is quite a simple process, but the instructions issued with the Union wire-worm remedy state: "If preferred, the remedy can also be administered in liquid form, the powder being first dissolved as follows: Obtain an ordinary glazed china pot, as commonly used for household purposes, and empty into it one litre (1,000 c.c.) of clean water. Measuring tins holding exactly one litre when filled to the brim are supplied by the Division at a price of 1s. 6d. each. To this quantity of water add the contents of one phial of hydrochloric acid (supplied at 6d. per phial), stir with a wooden stick and shake in one tin of wire-worm powder. Keep stirring until the powder is completely dissolved, giving a clear pale-blue liquid. This will take about ten minutes, and apart from a very little dirt, the liquid should be without sediment.

Ten c.c. of this liquid are now equivalent to one five-notch spoon of powder, and hence the dose is 10 c.c. for every 100 lbs. body weight. A calf weighing between 200 lbs. and 300 lbs. would therefore get from 20 c.c. to 30 c.c., while a grown animal weighing 800 lbs. would get 80 c.c. It will probably be found more convenient to dilute the measured dose with a cupful of water and then give the diluted dose as a drench in the ordinary way. For measuring the quantity it is recommended that an ordinary glass cylinder of 100 c.c. capacity be procured from some chemical supply firm, but if an ordinary medicine glass is available, one-third of a fluid ounce may be taken as equivalent to 10 c.c. Thus, in the two examples quoted, the calf weighing 200 lbs. would get $\frac{2}{3}$ fluid oz. and the full grown animal of 800 lbs. would get $2\frac{2}{3}$ fluid ozs. It is not advisable to measure with a syringe, as the solution is liable to corrode the metal parts."

A point of considerable practical importance in connection with the laboratory cases is that although the animals became infected in September, their poor condition was attributed to trypanosomiasis, and the real cause was only discovered during the rainy season, when, in spite of antimony treatment and an abundance of grazing, they failed to improve. A careful *post-mortem* examination of one of them revealed the true cause, and the copper sulphate treatment was immediately applied to all of them. Although this apparently destroyed the wire-worm, the majority of the animals still failed to regain condition. It appeared that the effects of the mixed infection were too severe to be repaired. In practice, therefore, *animals should not be allowed to become too "poor" before efforts are made to determine and remove the cause.*

**Inoculation.**—The improvement of our cattle necessitates the introduction of bulls from without, either from the south or from overseas. Unfortunately the latter are susceptible to tick-borne diseases such as red-water and gall-sickness, and so long as ticks have not been completely eradicated this danger must exist. It is true that on certain farms dipping has been so conscientiously practised for many years that imported cattle live, but there is always the risk of infection taking place during the journey to such clean areas or from

stray ticks dropped from cattle passing over or near them. Even the cattle bred upon dipped farms grow up susceptible to infection, and the death of many of them when removed to infected areas has brought suspicion upon them and greatly restricted their sale. So long, then, as dipped areas are surrounded by tick-infested veld there is a grave risk to imported stock and the need to protect them against the dangers which beset them. To this end the method of inoculation has been applied since 1909 to several hundreds of imported animals, with varying success. Some of our most notable herds have been bred up from a foundation of native stock and an inoculated imported bull. For example, Mr. Jack Mack's famous herd of Herefords originated in this way, the grand old bull "Peerless," bred by His Majesty King Edward, having been mated with them. The successful results of inoculation prompted Mr. Mack to make further importations with a view to improving his herd, and from time to time good blood has been introduced. The two cows "Gem" and "Genesta," so famous in the show ring, are examples. Among other successful inoculated bulls may be mentioned the Sussex bull "Rosebush," imported in 1909 by the writer, the first Sussex bull in this Colony, the first to be inoculated, and the originator of Mr. Glanfield's famous herd of Sussex cattle; Messrs. Beamish Bros.' Hereford bull "California," Messrs. Cecil Roberts and Letts' Shorthorn bull "Baronet," and the bull "Aerial Knight"; indeed, a very long list of equally successful inoculated animals could be published to prove that, drastic as the inoculation process when applied to highly susceptible well-bred animals undoubtedly may be, it has played a very important part in the building up of the cattle industry in this Colony.

Inoculation has at all times been severely criticised, and too often faults for which it could not fairly be held responsible have been attributed to it. It has been said to cause sterility, loss of constitutional vigour, such serious "set-back" that the animal never recovers, and a hundred and one other harmful effects. The prepotency of some of the bulls mentioned, the success of so many in the show ring, the fact that at the last Salisbury Agricultural Show two recently inoculated Shorthorn heifers, recovered only ten days, won first and second in their respective classes,

and that two Red Poll bulls recently inoculated for experimental purposes at the Veterinary Research Station fetched the two highest prices at the show sale, not only refute these charges against the inoculation, but indicate that the fault must lie elsewhere.

The great difficulty in applying the inoculation process to an imported animal lies chiefly in the fact that those presented for inoculation so rarely conform to the specification laid down in the article entitled "Inoculation of Cattle against Red-water and Gall-sickness," which appeared in the *Rhodesia Agricultural Journal* of April, 1925, and was reprinted as Bulletin No. 536 of 1925. This reads as follows:

"The qualifications which render an animal suitable for treatment are:—

1. It should not exceed 15 months of age.
2. It should not be fat, forced or pampered.
3. Its breeding should not have been such as to have weakened its constitution.
4. It should be delivered at the inoculation camp in good health and free from ticks.
5. Females should not be pregnant and cannot be treated except under guarantee that they are not in calf."

Very rarely indeed is an animal which does not transgress one or other of these stipulations presented for inoculation, but equally rarely is inoculation refused if the owner earnestly desires that it shall be applied, because the expense of importation is generally so great that it is felt that every effort should be made to protect the enthusiastic purchaser—and he must be enthusiastic to have invested his money in this manner—against the inevitable risks to which the animal will be submitted. But the present method of inoculation is far from perfect. It necessitates the infection of the animal with two diseases, red-water and gall-sickness, from which it suffers more or less severely according to its age, condition and breeding. During the re-actions it has to be carefully watched, nursed and treated, and much depends upon the attention and skill it receives. In this way a grave responsibility is placed upon those undertaking this work, especially when they are called upon to inoculate animals which

are obviously unsuitable. What is really required is an easier, "fool-proof" method of rendering an animal immune, comparable, as it were, to the process of inoculation against quarter-evil. In future, therefore, it is hoped to be able to devote more time to research with a view to discovering such a method and less to the application of the present process to animals for which it was never intended.

There is a method which is practised with some success in the Union of South Africa which is less dangerous than the local method. Apparently it consists of the inoculation of animals of any age with a comparatively a-virulent strain of red-water parasite and a special variety of gall-sickness parasite (*A. centrale*) which is almost harmless. On two occasions in the past the Union virus has been tested out in Southern Rhodesia, but the results were not entirely satisfactory. Unfortunately, as Sir Arnold Theiler has pointed out, "we have different sorts of red-water, and (immunity against) one does not mean immunisation against another." This apparently explains our lack of success with the Union virus vaccine in this Colony. However, by the courtesy of Dr. P. J. du Toit, Director of Veterinary Services, a fresh supply has been received recently and further tests are being carried out. Although immunity against one strain does not always protect against another, there seems to be some overlapping. Thus immunity resulting from recovery from *A. centrale* injection may modify subsequent re-action due to injection with *A. marginale*, which is our local virus. Advantage may be taken of this fact. But such investigations take time, and in research work it often happens that nine hundred and ninety-nine failures occur before the most trivial success is achieved.

**Horse-Sickness Inoculation.**—It is pleasant, therefore, to record the most recent figures relating to the behaviour of the inoculated police horses during the past horse-sickness season, kindly supplied by the staff officer.

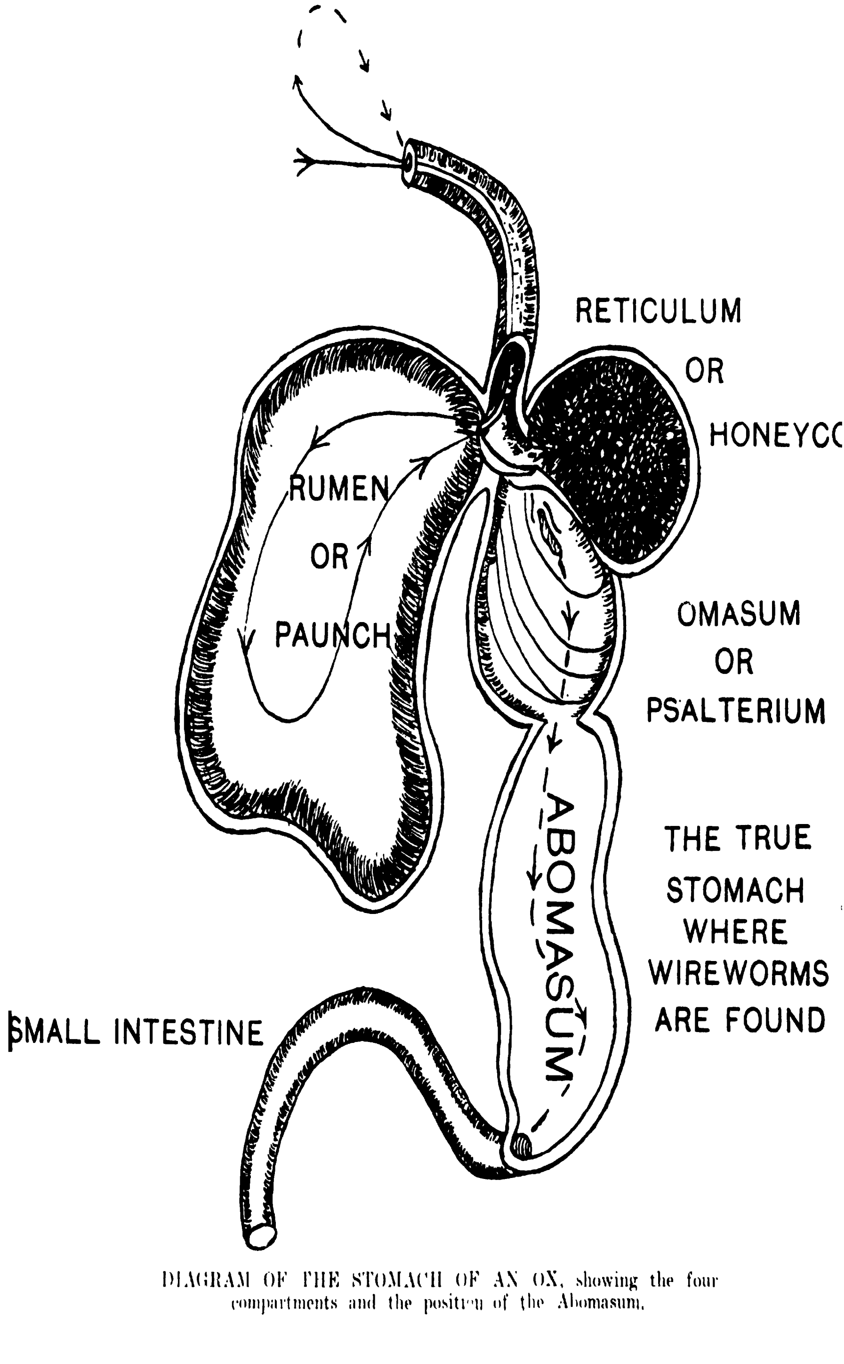



DIAGRAM OF THE STOMACH OF AN OX, showing the four compartments and the position of the Abomasum.

## HORSE-SICKNESS RETURN.

From 1st November, 1928, to 30th June, 1929.

| | | |
|---|---|---|
| Total number of inoculated riding horses on the strength of the B.S.A. Police ... ... ... ... ... | | 288 |
| Total number of inoculated "pack" horses ... ... ... | | 34 |
| Total ... ... ... ... ... ... ... ... ... ... ... ... ... ... | | 322 |
| Total deaths attributed to horse-sickness ... ... | | 9 or 2.79% |
| Diagnosis doubtful (3 cases) ... ... ... ... ... ... ... | | 6 or 1.86% |
| Total number of horses in Colony (compiled from Police reports) ... ... ... ... ... ... ... | 2,562 | |
| Total deaths from all causes ... ... ... ... | 313 | = 12.2% |
| Total number of inoculated horses dead from all causes ... ... ... ... ... ... ... ... ... ... | 69 | = 2.69% |

The following information has been kindly supplied by Cattle Inspector Harrington concerning his mare "Sophie," which was inoculated at the old veterinary laboratory in 1916 when she was two years old. From the laboratory she went to Borrowdale, in the Salisbury district, and remained there until 1917 on East Coast Fever cordon work. During that period she was not stabled, but was constantly exposed to infection. In 1917 she was taken to Plumtree and again was on constant patrols. In 1918 there was a bad outbreak of horse-sickness at Plumtree, and in the village some twenty to thirty horses are known to have died of horse-sickness; only the mare "Sophie" and a horse which had been used in the German South-West campaign survived. In 1919 she was taken to the Antelope Mine area, a notably bad district for horse-sickness, and remained there until 1921. In 1921 she was transferred to Umtali for the wet season, and in April, 1922, she was taken back to the other end of the Colony, that is, to Inyati, in the Bubi district, where she remained during the dry season. In October of that year she was taken to Melsetter, where she remained until March, 1923, when she was taken to Mount Selinda. She was on different East Coast Fever cordons in the South Melsetter district until January, 1926, and was exposed to every risk of horse-sickness infection. During the period that she was in the Mount Selinda district innumerable deaths of horses took place, and Cattle Inspector Harrington collected samples of blood from

three cases on the same farm upon which the mare "Sophie" was stationed. This blood was sent to the laboratory for experimental purposes.

During the above period no relapse or re-infection was noticed until 1928, when for a short time she suffered from a high temperature. She received no special treatment and recovered. Until recently she has been doing regular work. She has had three foals, one of which was inoculated and is now in Nyasaland, the second is now at Gatooma, and the third is about to be inoculated.

This record indicates that the immunity conferred by the inoculation has a very general application throughout Southern Rhodesia. Similar records from other owners of inoculated horses would prove of considerable interest.

It may be of interest also to record that the majority of horses taking part in the ring events at the recent Agricultural Show in Salisbury were inoculated animals, and many of them secured honours; for example, the 1st and 3rd prizes in the class for light weight hacks went to inoculated horses; and in the heavy weight hacks class the 1st, 2nd and 3rd prizes. The best hack on the show was an inoculated horse, and the Novices' and Open Jumping Competition were both won by the same inoculated horse.

Unfortunately the horse is no longer regarded as a commercial proposition, and there is little or no demand in this Colony for horse-sickness vaccine, except for race horses, polo ponies, police horses and private hacks. All that can be said of the inoculation process is that it has served its purpose and has played a part in the development of the country.

# A Visit to Ceres Farm, Shamva.

## AN IRRIGATION SCHEME AND ITS USES.

## ONE HUNDRED AND SEVENTY-SIX ACRES OF WHEAT.

By THE EDITOR.

One of Nature's greatest gifts to mankind is wheat, and there is no finer sight than a field of ripening grain with its golden sheen swaying in the wind. It is a sight which is unfortunately all too rare in Rhodesia for the reason that at present wheat can only be grown successfully during the dry months of the year under irrigation or in moist vlei lands. We therefore have to obtain the bulk of our supplies from outside the Colony, mainly Australia, Canada and the Union of South Africa, and our bill for this essential of life amounts to over £100,000 annually. It is pleasing to note that at Ceres farm Mr. Morkel is helping materially to reduce our indebtedness to farmer friends overseas and in the south, and thus retain in the Colony money which is much needed.

Mr. Morkel has at Ceres one hundred and seventy-six acres under irrigated wheat, which at the time of our visit was in varying stages of ripeness, and after the drab monotony of the veld at this time of the year presented a wide expanse of refreshing colour. It is necessary at this stage to explain how Mr. Morkel manages to irrigate such a large area.

The water is obtained from the Umwindsi River, a tributary of the Mazoe River, having a well sustained flow. Ceres farm is situated in the catchment area of the Poorti

River, another tributary of the Mazoe, and thus the water for irrigation has had to be carried across the divide between the Umwindsi and Poorti Rivers. A grant for water to irrigate 800 acres was made, and the scheme was pegged out in 1923 and construction commenced. There were no great engineering difficulties from the professional point of view, but it was a project calling for a great deal of hard work and careful attention to details. The whole scheme was carried out by Mr. Morkel and his son, technical supervision being given by the Irrigation Branch of the Department of Agriculture. Full particulars of construction were given in the *Rhodesia Agricultural Journal* of October, 1925. A weir of gravity section some 120 feet long and about 10 feet in height at the deepest point in the river was constructed in concrete and founded on solid rock. At the left bank the canal takes off from the weir, the first 100 feet having a concrete retaining wall on the river side. From here the canal continues for two and a half miles through earth with rock outcrops occurring at various points. The canal is of a minimum depth of 2 feet 6 inches, with a bed width of 4 feet 6 inches and side slopes of ¾ to 1, the grade being 1 in 2,000. At the end of this length of canal a tunnel commences. The construction of this tunnel, in length some 2,400 feet, was the biggest work on the whole scheme. It is graded 1 in 800, and is capable of discharging 10 cusecs of water when the water depth is 1 foot 7½ inches, and when flowing full will discharge some 23 cusecs. The tunnel has a reinforced concrete lining throughout, the reinforcement being No. 9 expanded metal. The concrete blocks were cast on the farm by the Duff-Abrams method. After leaving the tunnel the water follows a natural watercourse for about two miles, when it is again diverted from this stream bed by means of a small weir and carried away by a further length of canal to the lands which are being irrigated. The canal passes in front of the homestead, and at this point a 5 feet concreted drop enables a small ram to be operated, which supplies the house with water. The water first passed down the whole length of the canal and through the tunnel in April, 1925, and there are at present about 400 acres under irrigation.

Of the wheat which is being grown Klein Koren is at present the most favoured variety, occupying 165 acres. This

Portion of weir, showing canal intake, Ceres irrigation scheme, Shamva

Home-made water wheel operated by the irrigation furrow at Ceres Farm, Shamva.

Boer oats at Ceres Farm, Shamva, 12th September, 1929.

bearded wheat is not so acceptable to bird marauders as the beardless varieties. Incidentally, the work of scaring away birds engages the attention of 35 picannins, who with weird and alarming vocal noises do their best to protect the crops. Mr. Morkel expects to reap an average of six bags per acre from his wheat. Other varieties under trial are Kenya Governor, Quality and Droop No. 2, each of which appeared to be doing well, particularly the first-named. Mr. Morkel informed us that he can sell his wheat at 30s. a bag f.o.r. Shamva, a price which is, of course, maintained by the Customs rebate granted on imported wheat used for blending with Rhodesian. There were small acreages of barley and Boer oats growing alongside the wheat, of which the oats were showing up particularly well. Thus the total acreage under cereals was 199. Planting commences in April, and four irrigations are given during the growing season. Sowing is at the rate of 58 lbs. per acre, and the whole area is fertilised with an application of 200 lbs. of superphosphate per acre, grain and fertiliser being drilled in together by means of a Massey-Harris corn drill.

The wheat is reaped, winnowed and bagged in one operation by the Sunshine Stripper, which came from Australia. Reaping is performed by a system of cast iron "fingers," which remove the ears from the stalk, while beaters knock the ears on to a tray. From here they are elevated to the thrasher on the top of the machine, from whence the ears fall on to a screen and are winnowed. The grain is again elevated and gravitated into a box alongside the machine, from where it falls into sacks ready for delivery to the mill. Mr. Morkel is a great believer in maintaining soil fertility, and it is his intention to sow the whole of the land now under cereals to Sunn hemp during the summer season, which in turn will be ploughed under.

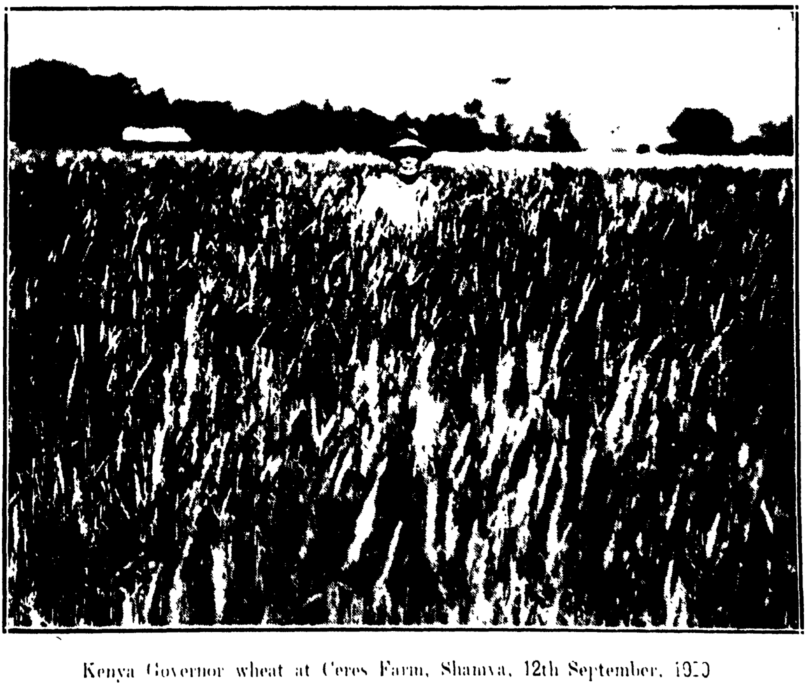
Another useful purpose to which the water is applied at Ceres is in the growing of early green mealies. About 60 acres are devoted to this crop, which is picked in November, December and January, and the ears, after being "cooked," are sold to mine natives, who are very fond of them and are prepared to pay as much as one penny each for the delicacy. Tomatoes command a good price during the winter months, and Mr. Morkel showed us an area of four acres which had

yielded £450 in one season. This, we think, must be a Rhodesian record. Potatoes are grown under irrigation, although not on a very large scale, and help to swell the farm revenue.

Ceres is a good maize farm, and about 800 acres were under this crop last season, the out-turn being some 7,600 bags, or 9½ bags to the acre. The size of the farm is 4,600 acres, of which 1,250 are under crops each year. As stated previously, Mr. Morkel realises the necessity of maintaining soil fertility, and each year a quarter of his maize lands is green manured with Sunn hemp. He has proved by experiment that it pays to treat the land in this manner, and has testified to the fact in an article which he wrote for this Journal some while ago. Seeing the size to which native trees attain at Ceres, one was interested to know what it cost to stump land of this description, and the figure given was £5 per acre. Ploughing at Ceres is continued day and night until completed. At night acetylene lamps are used to lighten the darkness, and it is needless to say that the oxen work better in the cool of the night. A tractor (Wallis) is in commission, and is doing good work, but the bulk of the ploughing is done by oxen. It was interesting to hear from Mr. Morkel that he intends to put in drains every 50 yards in his vlei maize lands to combat diplodia, which he finds is always more prevalent in swampy places. Dairying and pigs are a source of revenue, the breed of pig favoured being the Large Black, of which some good specimens are bred for the Bacon Factory. Pens for feeding over 100 oxen are almost complete. It is intended to use these next year, and it is hoped that at least 200 head of slaughter oxen, finished for the overseas or Johannesburg market, will augment the income from side lines and also be the means of supplying the necessary humus to the red lands, many of which are showing the need of it.

A very good pedigree Friesland bull and 13 grade cows and 9 heifers form the nucleus of a dairy herd. About 700 head of Africander grade cattle are running on the farm, which is completely fenced on the boundaries, and there are also five large paddocks. Water is used to irrigate the veld at night, being regulated every evening, so that some green grazing is provided for stock during October and November.

Klein Koren wheat at Ceres Farm, Shamva, 12th September, 1929



Kenya Governor wheat at Ceres Farm, Shamva, 12th September, 1929

There are now 380 sheep running on the farm. These have all been graded up from ewes bought from the Mashonas, sired by pure-bred Blackhead Persian rams.

The rate of increase can be gauged when it is stated that in February, 1928, there were 170 head and 22 have been sold, and about 10 slaughtered for home consumption since that date. There is no doubt a good future in store for the careful sheep farmer breeding solely for slaughter purposes.

Retracing our steps homeward as the shadows lengthened, one could not help pausing to admire the pleasant scene presented by the homestead in its picturesque setting, with citrus trees in their refreshing greenery at the foot of the hill, and terraced gardens bright with flowers, rising until the upper level is reached, where the comfortable house stands in a glorious array of flowering shrubs and flowers. This and the distant view of the crops, testifying to the courage, foresight and enterprise of the owner, make up a scene not soon forgotten.

# Notice.

## BLUE TONGUE VACCINE.

Union blue tongue vaccine will be available for issue by this Department in October. The vaccine is put up in bottles containing multiples of twelve, price one penny per dose, post free.

Chief Veterinary Surgeon.

# The Mineral Aspects of Pasture Nutrition

## IN RELATION TO THE LIVE STOCK INDUSTRY.

(A Paper read before the British Association for the Advancement of Science at Pretoria, 2nd August, by Mr. A. D. Husband, Chief Chemist.)

Modern research in animal nutrition has demonstrated that mineral deficiencies in the diet can exercise a marked influence on the health and productive capacity of farm animals, and that these deficiencies can occur in animals grazing on natural pastures as well as in animals being stall fed. These findings have given a great stimulus to research into problems of the mineral requirements of animals, and have opened up a new line of attack upon many of the unsolved difficulties connected with stock rearing both in Europe and the more distant pastoral countries in the Empire.

It is a remarkable fact that although the possible importance of the ash of plants in the nutrition of farm animals was suggested nearly a century ago, it is only in comparatively recent years that this subject has begun to receive the attention it deserves, and even to-day our knowledge of the functions of the various mineral elements found in the animal body is extremely limited.

A matter of ten years ago few, if any, stock breeders, even in Europe, made a practice of feeding minerals to their farm stock, other perhaps than common salt; but to-day the inclusion of mineral licks or oil cake compounded with minerals is with many farmers common and every-day practice. Although the value of such mineral supplements is well recognised by many agriculturists and stock breeders in Europe, it is probable that their value is even more fully realised in the more distant parts of the world. This is due

to the fact that diseases associated with mineral deficiencies in the diet have been more noticeably revealed in the colonies, where stock breeders have attempted to evolve higher producing animals than the native stock on the natural pastures, and in these instances the addition of mineral supplements to the diet of such animals has been attended with marked beneficial results.

In no country has the importance of the mineral content of the ration been more fully recognised than in South Africa. The work of the Onderstepoort Veterinary Research Station on aphosphorosis is almost universally known in this country, and has been appreciated to such an extent that there are few stock breeders south, and also probably north, of the Zambesi who do not make a point of regularly giving their animals some form or other of a phosphatic mineral supplement, whether or not they suspect a phosphorus deficiency in their grazing veld.

The economic importance of research into the mineral content of natural pastures has also been demonstrated by the Onderstepoort workers, as, by the application of their laboratory findings, they have been successful in converting large areas of impossible cattle country in Africa into useful pastoral areas.

The work of the animal nutrition stations at Cambridge and Aberdeen has produced a considerable amount of information on the subject of the nutritive value of pastures from the point of view of both the organic and inorganic constituents, and the results so far attained have led to a considerable revision of the previous methods of pasture management.

The work of the Rowett Institute, with which I intend especially to deal, has been almost entirely confined to the mineral aspects of nutrition, and the work on pasture at this Institute is mainly concerned with the problems connected with natural pastures in which the mineral content is known or believed to be below the requirements of the grazing animal.

It is a well recognised fact that the requirements of animals for the different food ingredients vary according to the rate of growth of the animal and the work it has to perform. So far as the organic constituents of foodstuffs

are concerned, certain standards based on actual feeding trials have been laid down as to the requirements of different types of animals for maintenance and production. It is possible, therefore, from these standards to gauge approximately the requirements of protein, fat and carbohydrates for different animals according to their rate of growth and productivity.

With the minerals, however, we have no such standards, and the gauging of the correct proportion and ratio of the mineral elements in the ration is much more difficult and indefinite.

It has been the custom of the workers of the Rowett Institute to use the composition of the particular milk of the species as a guide to the requirements of the young of that species for minerals. It is a reasonably fair assumption that the milk of the species should correspond closely with the requirements of the young animal and should also bear a close relationship to the requirements of the lactating animal; hence this method would appear to be the most reliable guide possible.

An interesting table has been drawn up by Orr (1) in his recent monograph on "The Mineral Content of Pastures," showing the comparison between the mineral content of pastures with that of some other common foodstuffs, with milk as the standard of comparison.

It will be seen from this table that, on the basis of the energy unit, there is a fairly close resemblance between the mineral content of good pasture and that of cow's milk. Orr states that "the close correspondence of the mineral content of a good pasture to the mineral requirements of the animals is doubtless one of the most important factors in the well-known high nutritive value of pasture for promoting growth and maintaining health in herbivora."

## TABLE I.

*Comparison of Mineral Content of Good Pasture with that of some other Foodstuffs, with Milk as the Standard.*

1,000 calories contain the following amounts in grams:

| | Lime (CaO) | Phosphoric oxide ($P_2O_5$) | Soda ($Na_2O$) | Potash ($K_2O$) | Chlorine | Nitrogen |
|---|---|---|---|---|---|---|
| Cow's milk ... | 2.38 | 3.43 | 0.81 | 3.21 | 1.4 | 8.32 |
| Good pasture ... | 3.64 | 2.75 | 0.94 | 11.54 | 3.5 | 10.40 |
| Maize ... | 0.03 | 1.83 | 0.13 | 1.36 | 0.001 | 4.64 |
| Wheat ... | 0.14 | 2.75 | 0.13 | 1.59 | 0.2 | 5.60 |
| Potatoes ... | 0.28 | 1.60 | 0.49 | 5.56 | 0.3 | 3.36 |
| Turnips ... | 1.18 | 1.96 | 0.33 | 5.40 | 0.42 | 3.87 |
| Decorticated cotton cake | 1.22 | 11.26 | 0.24 | 8.05 | 0.11 | 26.32 |
| Molasses ... | 5.35 | 0.56 | 1.02 | 10.26 | 3.56 | 4.23 |

In the investigational work that has so far been carried out at the Rowett Institute, attention has been directed chiefly upon the elements calcium, phosphorus, sodium, potassium and chlorine. These are the elements required in the largest amounts by the animal, and most of the recorded mineral deficiencies in animals have been associated with these five elements. This does not mean that the other minerals known to occur in the animal body, such as iron, iodine, manganese, magnesium, sulphur, silicon, copper, boron and fluorine, may not be equally as important in the nutrition of the animal, but in general, deficiencies of these elements in pastures are probably less likely to occur than in those on which work is at present being conducted. It is true that Aston (2) in New Zealand has been successful in correlating "bush sickness" with a deficiency of iron in the pastures, but the areas in which such a deficiency is suspected to occur are very limited.

No cases are on record of analyses showing marked deficiencies of magnesium, sulphur and silicon in grasses, and

it is probable that these elements are contained in sufficient amounts in all grasses to meet the requirements of animals. In the case of manganese, fluorine, boron and copper, no information is available as to the requirements of animals for these elements.

From the analytical data already available it has been shown conclusively that the mineral content of pastures may differ considerably, according to certain factors, such as—

(1) species of plants;

(2) stage of maturity;

(3) climatic conditions;

(4) nature of soil and manurial treatment.

The following table shows the varying content of minerals in different species of pasture plants analysed by Jones and Bullis (3):—

TABLE II.

*Percentage of Minerals in Dry Matter in Different Species of Pasture Plants.*

| | Potash ($K_2O$) | Lime (CaO) | Magnesia (MgO) | Phosphoric oxide ($P_2O_5$) |
|---|---|---|---|---|
| Timothy ... | 1.55 | 0.108 | 0.060 | 0.405 |
| Orchard grass ... | 2.24 | 0.115 | 0.086 | 0.35 |
| Clover, red .. | 2.10 | 1.50 | 0.393 | 0.396 |
| Clover, alsike ... | 2.72 | 1.26 | 0.348 | 0.513 |
| Alfalfa ... | 2.25 | 1.76 | 0.343 | 0.556 |
| Vetch ... | 2.06 | 1.12 | 0.300 | 0.579 |

It will be noted that very marked variations, particularly in the content of potash, lime, magnesia and sulphur, can occur in the various species of pasture plants, and that this difference is most marked between the grasses and legumes. The probability is suggested by Orr that the recognised increased grazing value of pastures containing a good proportion of leguminous plants is in some measure due to the increase in the mineral content as well as to the increase in the protein content.

**Stage of Maturity.**—That the feeding value of pastures varies throughout the grazing season is a fact that has long been recognised by farmers, but the reason for this has only of recent years become more completely understood.

Various investigators have from time to time recorded changes in the botanical and chemical composition of herbage at different stages of maturity, but the first thorough systematic investigation of the seasonal variations in the mineral composition of pasture grasses was carried out by Cruickshank (4) at the Rowett Institute in 1924. The results of this investigation showed a definite seasonal variation which was most marked in the case of the calcium and was also definite in the case of phosphorus, which tended to rise and fall with the calcium.

The range of variation was greater in good types of pasture than in those of inferior quality, and the period at which the maximum was reached differed in different fields. Where the pasture was heavily grazed the percentages increased until well on in the season, and it was suggested by Cruickshank that the period at which the maximum content was reached could be influenced to a considerable extent by the nature of the grazing. The findings indicate, therefore, that the seasonal variation may not be uniform in all pastures and the period of the maximum mineral content may be controlled partially by methods of pasture management. This is a very important finding and suggests a line of investigation for workers in parts of the world where for any reason it is not practicable to cut the grass for hay purposes at the season of the year when normally the mineral content of the grass is around the maximum.

**Climatic Conditions.**—Very little attention has been paid to climate as a factor in determining the composition of pastures, though it is well known that the amount of sunshine, the temperature and the rainfall all affect the rate of growth and the rate of transpiration, and that the latter factor has an influence on the amount of salts in solution brought in by the roots of the plant.

It is interesting to note, however, that Lewite (5), in studying the effect of drought on the nutritive value of plants, compared the calcium and phosphorus content of oat straw in a wet year with that of a dry year. He found the per-

centage of calcium higher and the percentage of phosphorus lower in a dry year than in a wet year. Woodman (6), in the course of his studies on seasonal variations in pastures, records a sharp fall in the percentage of phosphorus in grass following a month's spell of dry weather, which was arrested shortly after a heavy fall of rain.

From the small amount of information available it would appear that drought may reduce the amount of phosphorus in the herbage, but, as Orr states in his monograph, "There is not sufficient reliable evidence, however, to determine whether it seriously affects the percentage of any of the other constituents. As there are extensive areas of grassland with a low rainfall, the effect of drought on the chemical composition of the pasture plants warrants further investigation." The question of climatic conditions, particularly in regard to the effect of drought, is a question probably of far greater importance to research workers in grassland problems in arid and semi-arid regions, as it is hardly probable, particularly in the temperate parts of Europe, that the incidence of drought will be often or severe enough to exercise any marked or permanent effect on the nutritive value of the pastures.

In the semi-arid regions, however, drought is an important factor and one that has often brought disaster to those engaged in pastoral industries.

It may be of interest here to mention the results from a preliminary experiment carried out during the last two seasons at the Salisbury Experiment Station, S. Rhodesia. The object of the experiment was to determine whether the application of a fertiliser containing the three essential manurial ingredients would exercise any immediate effect on the protein and mineral composition of the ordinary veld herbage. At the same time it was thought that an analysis of the herbage at different periods during the growing season might give some possible explanation of the falling off in the growth and productivity of grazing cattle generally experienced in Rhodesia during the latter part of the rainy season, when the quantity factor as regards herbage appears ample.

It is not proposed at the present moment to discuss these experiments in detail, but certain of the data obtained, which

are presented in the following table, are of interest in connection with the influence of drought on the chemical composition of veld herbage in S. Rhodesia.

## TABLE III.

*Analyses of Grasses from Experimental Plots for Year 1928-29. Calculations on 100 per cent. Dry Matter.*

| | Date of sampling | Acid-soluble ash | Fibre | Crude protein | Lime (Cao) | Phosphoric oxide ($P_2O_5$) | Chlorine | Potash ($K_2O$) | Soda ($Na_2O$) |
|---|---|---|---|---|---|---|---|---|---|
| Nitrate of soda plus potash plus phosphates | 8/2/28 | 4.84 | 29.83 | 6.23 | 0.51 | 0.49 | 0.32 | 2.06 | 0.16 |
| | 3/4/28 | 4.55 | 30.63 | 7.96 | 0.56 | 0.32 | 0.32 | 1.94 | 0.09 |
| Sulphate of ammonia plus potash plus phosphates | 8/2/28 | 3.84 | 31.51 | 5.87 | 0.45 | 0.59 | 0.31 | 1.99 | 0.39 |
| | 3/4/28 | 4.09 | 31.29 | 9.04 | 0.55 | 0.29 | 0.32 | 1.86 | 0.05 |
| Control. No fertiliser | 8/2/28 | 3.50 | 28.55 | 5.76 | 0.57 | 0.44 | 0.30 | 1.78 | 0.09 |
| | 3/4/28 | 2.63 | 29.23 | 6.25 | 0.61 | 0.32 | 0.24 | 1.11 | 0.09 |
| Nitrate of soda plus potash plus phosphates | 5/1/29 | 4.78 | 33.90 | 6.78 | 0.72 | 0.60 | 0.52 | 2.27 | 0.24 |
| | 8/2/29 | 4.48 | 40.25 | 6.00 | 0.50 | 0.63 | 0.36 | 2.28 | 0.02 |
| | 3/4/29 | 4.54 | 39.65 | 6.88 | 0.41 | 0.50 | 0.33 | 2.58 | 0.02 |
| | 7/5/29 | 3.24 | 40.29 | 3.39 | 0.42 | 0.23 | 0.30 | 1.45 | 0.17 |
| Sulphate of ammonia plus potash plus phosphates | 5/1/29 | 5.16 | 34.53 | 7.97 | 0.69 | 0.50 | 0.52 | 2.02 | 0.19 |
| | 8/2/29 | 4.27 | 41.04 | 6.17 | 0.51 | 0.45 | 0.39 | 2.06 | 0.22 |
| | 3/4/29 | 4.18 | 36.89 | 7.14 | 0.44 | 0.57 | 0.43 | 2.36 | 0.18 |
| | 7/5/29 | 2.96 | 39.63 | 3.25 | 0.43 | 0.23 | 0.25 | 1.22 | 0.28 |
| Control. No fertiliser | 5/1/29 | 4.25 | 31.07 | 7.17 | 0.60 | 0.35 | 0.38 | 2.22 | 0.18 |
| | 8/2/29 | 3.96 | 37.90 | 6.16 | 0.56 | 0.36 | 0.32 | 2.19 | 0.05 |
| | 3/4/29 | 3.48 | 36.33 | 6.30 | 0.46 | 0.42 | 0.27 | 2.52 | 0.06 |
| | 7/5/29 | 2.62 | 40.23 | 3.11 | 0.35 | 0.11 | 0.21 | 1.26 | 0.13 |

A study of the figures for the phosphorus content of the grasses analysed during the years 1928 and 1929 show marked differences in the aftermath sampled in 1928 to the aftermath sampled in 1929. The date on which the hay was cut and the aftermath sampled was exactly the same in each case. At the beginning of the rainy season in both years the plots from which these grasses were taken received, in addition to nitrogen and potash, a dressing of superphosphate, 19.5 per cent. $P_2O_5$, at the rate of 100 lbs. to the acre. It will be seen that the aftermath in 1928 contains a very much lower phosphorus content than the grass cut for the hay crop, and is also considerably lower than the aftermath from the same plots during the year 1929. The reason for this was not very clear at the time and was thought probably to be due to the seasonal variations, although it was noted that no rain fell from the 11th of February until the 4th of March—a period of 21 days. The rainfall during the period of growth of the aftermath in 1929 was 7.5 inches against 5.6 inches over the same period in 1928, and the longest period without rain during February and March, 1929, was six days. It therefore appears fairly evident that climatic conditions were responsible for the fall of phosphorus in the aftermath during 1928, and the results tend to show that a period of drought can exercise an influence on grasses in Africa similar to that found by Woodman in his experiments at Cambridge.

A further point of interest in this experiment was the marked fall in the protein and mineral composition of the grass cut in May to that cut in April.

April marks the end of the rainy season in Rhodesia, and the rainfall is usually very scanty in this month. The total rainfall in April, 1929, was only 0.14 inch.

This fall in the composition of the grass was apparent on all three of the experimental plots, and that it was not due to the stage of maturity is evidenced by the analyses, shown in Table IV., of the grasses from the veld bordering on the experimental plots; these had not been cut for hay, and therefore represent the whole season's growth. Although the general composition of this grass is shown to be much poorer at the beginning of April than the grass on the experimental plots, it will be seen that an equally marked decrease in the composition has taken place, and the evidence

is therefore fairly conclusive that this change is due to the conclusion of the rains and the rapid drying out of the soil. This finding is of great importance to farmers in Rhodesia, as it is their usual custom to commence hay-making only after the rains have ceased—usually about the end of April or the beginning of May.

TABLE IV.

*Analyses of Grasses from Outskirts of Experimental Plots. Calculated on* 100 *per.cent. Dry Matter.*

| Date of sampling | Acid-soluble ash | Ether extract | Fibre | Nitrogen | Lime (CaO) | Phosphoric oxide ($P_2O_5$) | Chlorine | Potash ($K_2O$) | Soda ($Na_2O$) |
|---|---|---|---|---|---|---|---|---|---|
| 3/4/29 | 3.01 | 1.37 | 40.76 | 0.602 | 0.383 | 0.154 | 0.142 | 1.254 | 0.124 |
| 30/5/29 | 2.10 | 1.38 | 42.80 | 0.384 | 0.383 | 0.095 | 0.156 | 0.769 | 0.212 |

**Nature of Soil and Manurial Treatment.**—It has been established quite definitely that both the physical condition as well as the supply of the various plant food elements in soils may be reflected in the yield and quality of the herbage obtained, and that the value of various species of grasses is largely dependent on the environment in which they are growing.

The influence of drainage on waterlogged soils and of manuring on low producing or impoverished soils has, wherever carried out, been attended by a marked increase in the quality and palatability of the herbage to grazing stock.

The chief aim, however, in the manuring of grasslands carried out by agriculturists in the past has been to increase the quantity factor or carrying capacity of the lands. In a few exceptional cases only has the manuring been considered in the light of its possible influence on the mineral composition of the grass. Reports, however, by various workers are on record, showing that treatment of soils with mineral fertilisers in certain areas where nutritional diseases associated with mineral deficiencies occur in the grazing animal has resulted in the incidence of the diseases being materially lessened.

A comparison of the protein and mineral composition of cultivated pastures with that of some natural untreated pastures is of interest, and shows the marked differences which exist in pastures in various parts of the world. The figures for all of these samples other than those for Southern Rhodesia have been taken from the records of the Rowett Institute.

TABLE V.

*Average Mineral Content of Different Types of Pasture.*

| | No. of samples | Silica-free ash | Lime (CaO) | Phosphoric oxide ($P_2O_5$) | Soda ($Na_2O$) | Potash ($K_2O$) | Chlorine | Nitrogen | Fibre |
|---|---|---|---|---|---|---|---|---|---|
| Cultivated pasture ... | 24 | 6.64 | 1.00 | 0.74 | 0.25 | 3.18 | 0.95 | 2.83 | 23.0 |
| Natural pasture (all grazed)... | 22 | 5.85 | 0.65 | 0.67 | 0.37 | 2.66 | 0.64 | 2.50 | 24.5 |
| Poor hill pasture (partly grazed) | 35 | 5.49 | 0.56 | 0.60 | 0.41 | 2.60 | 0.60 | 2.54 | 25.2 |
| Island of Lewis | 1 | ... | 0.29 | 0.24 | 0.38 | 0.68 | 0.12 | 1.34 | 25.7 |
| Falkland Islands | 55 | 4.56 | 0.29 | 0.54 | 0.31 | 2.20 | 0.70 | 1.95 | 29.3 |
| Southern Rhodesia | 1 | 3.01 | 0.383 | 0.154 | 0.124 | 1.25 | 0.14 | 0.60 | 40.76 |

The information recorded at the time of the collection of the samples analysed by the Rowett Institute shows that the feeding value of the pastures as determined by the number of animals grazing per unit area, the rate of growth of the young, the percentage fertility and the health, are roughly parallel with the percentage "silica-free ash" which represents the total metabolisable minerals.

Apart from the sample from the Island of Lewis, it will be noted that the Rhodesian veld grass is considerably poorer in all of the mineral elements, with the exception of lime, than the other types of pasture.

Even compared with the sample from the Island of Lewis, the veld grass does not show up very favourably, for, although slightly better supplied with lime and potash, it is lower in phosphate and contains less than half as much nitrogen.

This analysis cannot, of course, be taken as truly representative of the value of the grassland all over Rhodesia right through the year. It is probable, however, that the average hay made in Rhodesia and the value of the majority of the grazing during the winter months are, if anything, slightly poorer than is represented by this sample of grass, which was taken at the beginning of April from red doleritic loam soil, which is fairly typical of the best maize soils of the Colony. This type of soil is considerably richer than the average soils of Southern Rhodesia, and the grass was taken at a period somewhat earlier than the time at which grass is usually cut for hay.

It is highly probable that this low mineral content, combined with the low protein and high fibre of the grass, is the cause of the inhibition in the rate of growth which is apparent in young grade animals grazing in Rhodesia in the winter months, and it is little wonder that there are many deaths from so-called "poverty" among grade cattle and working oxen, even though the quantity factor of the grazing on the veld appears ample.

The possible influence of mineral fertilisers applied to the soil on the mineral composition of the herbage is very clearly brought out by the results of some fertiliser trials carried out at the Rowett Institute on (a) very poor moorland soil, and (b) cultivated soil.

TABLE VI.

| Fertiliser applied | Poor moorland soil | | Cultivated soil | |
|---|---|---|---|---|
| | Lime ($CaO$) | Phosphoric oxide ($P_2O_5$) | Lime ($CaO$) | Phosphoric oxide ($P_2O_5$) |
| Nil (control) ... | 0.59 | 0.29 | 1.16 | 0.96 |
| Lime ... | 0.77 | 0.30 | 1.37 | 0.92 |
| Superphosphate ... | 0.94 | 0.71 | 1.16 | 0.93 |
| Lime plus superphosphate ... | 0.98 | 0.73 | 1.56 | 0.92 |

It will be seen that phosphatic treatment was able to effect an increase of 150 per cent. in the phosphoric oxide content of the herbage of the poor soil, which produced a herbage undoubtedly deficient in phosphate, whereas on the rich cultivated soil, the herbage of which was already rich in phosphate, no increase in the phosphoric oxide content was produced.

A further interesting experiment in connection with fertiliser treatment was that carried out by Godden (7). In this experiment ten plots of a very uniform character were sown down to red clover, and each plot received different fertiliser treatment.

The control plot received a fertilising dressing containing calcium, magnesium, sodium, potassium, iron, phosphorus, chlorine, sulphur and lime, and from each of the other nine plots one ingredient was omitted. The following figures taken from his tables show that the same species of plant can be considerably altered by different manurial treatment:—

| | Complete fertiliser | Omitted from complete fertiliser | | |
|---|---|---|---|---|
| | | Calcium | Phosphorus | Potassium |
| Lime, per cent. ... | 2.41 | 1.94 | 2.25 | 2.84 |
| Phosphoric oxide, per cent. ... | 0.65 | 0.62 | 0.63 | 0.58 |
| Potash, per cent. ... | 5.99 | 6.42 | 5.98 | 3.53 |

The most significant variation is in the case where the potash was omitted, but the omission of lime was also reflected in the crop.

The above results were obtained from fertiliser experiments carried out under proper experimental conditions, and it may be of interest, therefore, to observe the variations which may take place under ordinary farming conditions as practised on different farms. In Cruickshank's investigations into the seasonal variations two of the fields chosen were adjoining, but were the property of different farmers. On the one farm care was taken in choosing the seeds mixture and in rotational manuring, and on the other farm less attention was paid to these points.

The two fields were termed "good pasture" and "poor pasture" respectively, and the following analytical data taken from the tables given in the report of the above investigation show the difference in the chemical composition of these pastures on 6th July, 1924.

*"A" (Good Pasture).*

| Lime ($CaO$) | Phosphoric oxide ($P_2O_5$) | Soda ($Na_2O$) | Potash ($K_2O$) | Chlorine | Nitrogen | Fibre | Silica-free ash |
|---|---|---|---|---|---|---|---|
| Per cent. | Per cent. | Per cent. | Per cent. | Per cent. | Per cent. | Per cent. | Per cent. |
| 1.420 | 0.702 | 0.841 | 2.898 | 0.917 | 3.328 | 20.69 | 8.09 |

*"B" (Poor Pasture).*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0.563 | 0.516 | 0.362 | 1.963 | 0.546 | 1.748 | 28.09 | 4.48 |

It will be seen that the protein and the percentages of all the minerals are much lower in the "poor pasture" than in the "good pasture," and the analytical data give a clear explanation of the noted differences in the feeding value of these two pastures.

It is interesting to note the marked improvement that has been effected by fertilisation on the more or less improved pastures in Great Britain, and to observe that the most marked beneficial results from manurial treatment have been obtained on the poorest of pastures. The degree to which fertilisation of natural pastures in the more remote parts of the Empire will affect their nutritive value and carrying capacity has as yet received very little attention, but there is very little doubt that such fertilisation would lead to a more palatable, vigorous and heavier growth of herbage. In the previously mentioned experiment carried out at the Salisbury Experiment Station the yield of grass was considerably increased by fertilisation. The actual yields of grass and hay obtained are presented in the following table:

## TABLE VII.

*Yields of Hay from Experimental Plots for Year 1929.*

| | Date of cutting | Weight when cut, lbs. | Hay, per cent. | Yield of hay, lbs. | Yield of hay per acre, lbs. | Total yield, lbs. |
|---|---|---|---|---|---|---|
| Nitrate of soda plus potash plus phosphates | 8/2/29 | 1,357 | 39.2 | 532 | 2,128 | 3,492 |
| | 7/5/29 | 619 | 55.0 | 341 | 1,364 | |
| Sulphate of ammonia plus phosphates plus potash | 8/2/29 | 1,487 | 35.6 | 529 | 2,116 | 2,900 |
| | 7/5/29 | 354 | 55.3 | 196 | 784 | |
| Control. No fertiliser | 8/2/29 | 528 | 42.2 | 223 | 892 | 1,408 |
| | 7/5/29 | 208 | 62.2 | 129 | 516 | |

Although marked differences in both quantity and quality were noticeable from the weights of hay and its chemical analysis, it is highly probable that still more marked differences would have been apparent from a biological analysis, for the reason that on the fertilised plots a heavy growth of short, leafy grass was appearing which was not touched by the mowing machine, and hence was not analysed or shown in the yields of hay.

The foregoing is sufficient evidence of the possibilities of a mineral deficiency in the soil being reflected in the mineral composition of the herbage.

There is, however, very little available information regarding the possibilities of an excess of any particular element in the soil exercising a similar influence.

Where, of course, any gross excess of some particular mineral is present in the soil it is often characterised by a growth of herbage different to the usual species found in the area, or the material may by its toxicity or its physical influence render the soil entirely unsuitable for ordinary plant growth. In some cases excess of a particular mineral in the soil may be detrimental to the growth of one particular type of plant without exercising any apparent effect on other species. Instances of this occur in Rhodesia in the vicinity

of what is known as the Great Dyke. Many of the soils in this area contain an excess of magnesia sufficient to prove toxic to the production of maize, but apparently have little or no effect on the growth of ordinary veld grasses. As a matter of fact, many of these soils carry a dense growth of herbage, heavy timber, and, judging from the grazing animals, compare very favourably with any other grazing areas in the Colony.

This does not mean that the grass may not be altered in its mineral composition, but it is evidence that such alteration is not reflected either in the type of herbage or in the grazing animal.

Zuntz (8) studied the composition of hay from the areas in Germany in which osteomalacia was prevalent, and came to the conclusion that the disease was caused by a high ratio of potassium to sodium.

The analytical data given for these hays show the high ratio of K to Na to be due to a deficiency of sodium rather than to any excess of potassium.

The ratio of the different minerals to each other is undoubtedly of importance, as it has been shown by many workers that an excess of certain minerals in the diet can affect the absorption and retention of others. This influence, however, is probably only of importance when the excess of the one mineral is considerable or the other mineral affected is near the minimum of the requirement.

It has been clearly demonstrated by the work of the Rowett Institute on the influence of variations in sodium-potassium ratio that some of the earlier theories regarding the influence of excess of certain minerals on the absorption of others may have been based on incomplete and unsatisfactory experimental evidence, and that such changes may only be of a temporary nature and are followed by compensatory adjustments in the metabolism. On the whole the evidence so far available indicates that diseases in grazing animals are far more likely to arise from deficiencies of minerals in pastures than from excesses.

**Summary and Conclusion.**—Evidence has been presented to show the possible variations that may occur in the mineral composition of pastures in various parts of the world.

Attempts made to rectify deficiencies by the feeding of mineral supplements to the grazing animals have met with marked success, and in areas known to produce a herbage deficient in some particular inorganic element, such mineral feeding is a matter of great economic importance. It has also been shown that manurial treatment of pastures can exercise a marked influence on both the mineral and protein content of poor pastures, and at the same time improve the quantity factor as well as the quality factor. There is no question but that the most desirable form in which the minerals should be taken by the animal to assure of the maximum assimilation and utilisation is the form in which the minerals occur in the natural food of the animal, and the question of the improvement of natural pastures by means of fertilisation is one worthy of full investigation, even in areas where at first sight it might appear an uneconomic proposition.

One must not lose sight of the possible importance of the ratio of the organic to the inorganic elements, even in natural pastures, and it is possible that the improvement in the fertility of grazing lands by manurial treatment and better methods of pasture management may result in a more palatable, digestible and nutritious herbage, which biologically analysed may prove economic even in pastoral areas where the quantity factor is usually considered adequate to meet all requirements.

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# A Useful Rhodesian Grass.

*UROCHLOA PULLULANS.*

By Captain J. M. MOUBRAY, Chipoli, Shamva.

This grass is fairly common in these parts. When cultivated ground is allowed to revert it establishes itself, and on the dry ground, as opposed to the damp bottoms, soon obtains complete mastery.

The Botanical Division at Pretoria state:—"We have no local name for it. It is said to be quite a good fodder grass, relished by stock, but we have not yet carried out any feeding experiments with it, though we have a small plot of it on our experiment station."

I find on this farm that no matter how dry the ground, there is always a certain amount of green fodder among it, and as this is kept closely grazed, it spreads out and forms a covering which persists even in the height of the dry season.

The grass survives on the lighter soils which bake hard. It responds rapidly to dressings of lime and phosphatic manures. It seems to me that this grass is worthy of some attention.

The following remarks have been supplied by the manager of the Agricultural Experiment Station, Salisbury:

"A species of Urochloa which was introduced from the Mazoe Valley, and is probably the same as the one referred to by Captain Moubray, has been under trial here on a small plot since 1924. Its behaviour during that period indicates that it is a valuable fodder grass. Grazing tests have shown that it is relished by stock in the winter months, when the greater part of its herbage is dry, almost as much as when it is green. It produces seed fairly freely, which is another point in its favour. Plants resulting from seed

carried to lower levels by storm water have established themselves in the face of competition from certain other kinds of grass previously growing in the vicinity, thus indicating its aggressiveness and hardiness.

"A relative of this grass, namely, *Urochloa trichopus*, is very common in Matabeleland. In some districts it is the dominant grass, and it occupies large areas to the exclusion of most other kinds. It is highly valued for winter pasture, and it is reported that cattle whose diet is composed entirely of this grass in its dry state become fit for slaughter in a few months and realise enhanced prices because of the scarcity of fat cattle at that time of the year.

"On the experiment plots here the Mazoe Urochloa is more robust than *Urochloa trichopus*, and produces somewhat heavier crops of fodder, and may therefore be considered to be at least equal in value to the Matabeleland grass. Nevertheless, it does not yield as heavily as some of the other native grasses under observation here, whose fodder appears to be of equal value. A larger plot of the Mazoe Urochloa is being established here, in order that its merits may be further investigated."

# Accelerating the Sprouting of Potatoes.

## THE "HOT-BED" TREATMENT.

## AN INTERCHANGE OF OPINIONS.

*The following letter has been received from Mr. G. C. Watson, of Edenvale, Hartley*:—

"I read with interest Mr. Rattray's letter on the above subject in the August number of the *Agricultural Journal*, and am prompted to make a few remarks which might possibly interest some readers.

"When it is desired to accelerate the sprouting of potatoes that are clean and free from disease, I have found that placing the tubers on a 'hot-bed' for a few weeks brings about the desired result with much less expense than by using an airtight tank and carbon bi-sulphide. Most farmers have sufficient kraal manure and litter at this time of year to make a "hot-bed," whilst few can afford airtight tanks and carbon bi-sulphide.

"There may be many potato growers who employ this method, but for the benefit of those who do not it may be worth while to describe briefly how it is done.

"Several cartloads of kraal manure are collected and dumped in some convenient place, well watered and turned, and mixed with plenty of litter. When fermentation is well advanced a convenient sized heap is made, say, 6 feet wide and 2 or 3 feet deep and as long as required. The tubers are then placed on top, 5 or 6 inches deep (possibly a greater depth would be satisfactory), well watered, and then covered with a thick layer of grass to prevent loss of heat and evaporation. In about 10 days the tubers should be sprouting, and may then be removed while a further lot is dealt with.

"This method serves a twofold purpose: the manure is rendered more valuable by fermentation, and the weed seeds are destroyed, and by adding rock phosphate when the kraal manure is collected, we have a valuable fertiliser which, in the course of its preparation, has sprouted many bags of potatoes."

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## REPLY BY THE MANAGER OF THE AGRICULTURAL EXPERIMENT STATION, SALISBURY.

Whether or not the "hot-bed" method is less troublesome than the carbon bi-sulphide method will depend on a number of factors. If a supply of kraal manure and water is at hand and the farmer understands the making of "hot-beds" which are capable of maintaining a uniform and moderate temperature over a period of a few weeks, the growth of the sprouts of the potatoes may be accelerated fairly satisfactorily.

**Is "Hot-bed" Treatment Effective?**—Judging from the complaints arising from the use of this method which appear in the Agricultural Press from time to time, it seems that novices often experience disappointment when the "hot-bed" method is employed. In some cases it appears that insufficient heat is generated and the potatoes fail to sprout, but oftentimes either excessive heat or injurious gases impair the vitality of the tubers, rendering them valueless for seed purposes. Further, it is questionable whether the mere application of heat in this way actually causes the potatoes to commence to sprout, or whether it merely accelerates the rate of growth of the sprouts after germination has taken place in its natural course. It is well known that potatoes which are grown under irrigation in the spring and lifted in December and January do not commence to sprout again immediately, in spite of the humidity and high temperatures which prevail at that time of the year. Instead, they appear to require a period of rest before starting again on a new cycle of growth and development. The length of the period of dormancy required varies greatly between the different individual tubers of the same crop, and even between those from a common parent plant, for, while a few tubers begin to sprout within a week or two of their being lifted, others

remain inactive for as long as three months. Because of this the writer doubts whether the application of heat and moisture by the "hot-bed" method really accelerates germination as much as is generally believed, and thinks that in most cases the effect is merely an acceleration of the rate of growth of the sprouts after germination has taken place in the normal course. If germination can be accelerated by this method it is probably caused by the gases given off by the manure, or by the temperature being raised to a point where the vitality of the tuber is in danger of being impaired. For these reasons the method is often unsatisfactory, particularly when the heat is allowed to become too intense.

**The Carbon Bi-sulphide Method** is much safer, as there is no danger of injuring the potatoes if the fumigant is not used to excess. When this method is employed, definite acceleration takes place, or in other words, the potatoes are induced to curtail the period of dormancy which they normally require, and to awaken into renewed activity. Having passed this stage, the rate of growth of the sprouts can be increased by treatment with heat and moisture if desired, but here it may be pointed out that harmful effects are likely to result if the potatoes are planted in cold soil after growth has been forced by artificial heat.

**A Question of Expense.**—Mr. Watson's objections to the carbon bi-sulphide method because of the expense involved for airtight tanks and the cost of the chemical are not well founded. The chemical costs about 1d. per bag of potatoes treated, and although an airtight tank is an ideal container, a closed shed, such as a tobacco barn or conditioning pit, or even a hole in the ground lined with a tarpaulin, would probably be found satisfactory for practical purposes. The writer is informed that among potato growers in the Cape Province it is a common practice to treat the crop with carbon bi-sulphide against tuber moth. The stacks of potatoes are first enclosed in tarpaulins, which prevent the escape of gas sufficiently to allow it to penetrate among and into the tubers, where it effects the destruction of the moths. It may be assumed therefore that it is not necessary to employ an absolutely airtight container for treating potatoes which are to be sprouted, so the only expense involved is

the cost of transporting the bags of potatoes to the shed and back again, plus 1d. per bag for the chemical. The potatoes need not be emptied out, because the gas penetrates through the bags. The "hot-bed" method necessitates transporting the manure, turning, wetting, stacking and tramping it, as well as emptying the potatoes and re-bagging them.

**The Results of Recent Experiments** may be recorded for the benefit of interested readers.

It was found that when potatoes were subjected to twice the normal concentration of gas their germination was slightly retarded, though they were not visibly harmed, and they eventually sprouted in a normal manner. This suggests, however, that if the amount of chemical used had been as much as three or four times the quantity recommended, injury might have resulted.

In another experiment, tubers were left in the gas (normal strength) for 48 hours instead of the usual 24 hours, and it was observed that quicker and more uniform sprouting resulted. In other cases the potatoes were treated with the normal concentration of the gas for four and ten days respectively, and they were unharmed.

It appears therefore that while the potatoes may be subjected to the normal treatment for more than 24 hours without being harmed, the use of the chemical in larger quantities than that recommended (two tablespoonfuls per cubic yard, or approximately five bags) is not advisable. It may be pointed out that nothing is gained by treating potatoes which have already germinated. If such are treated, the tiny sprouts are killed and the object is defeated. After germination has taken place the growth of the sprouts may be hastened by treatment with heat and moisture, such as may be obtained by employing a properly prepared "hot-bed," a heated tobacco barn or by other suitable means.

# Poultry Husbandry in Southern Rhodesia.

## HOUSING AND FEEDING OF ADULT STOCK.

### PART I.—HOUSING.

By H. G. WHEELDON, Poultry Expert.

In laying out any poultry farm it is advisable to plan for gradual development from a small beginning to any desired scale. No attempt should be made to begin poultry farming on too large a scale. If the plant is well located and the business properly managed, a small beginning can gradually be increased and developed into a large poultry farm and placed on a paying basis more easily and more economically. The plant should give profits proportionate to its size during its stage of development. It is inadvisable to contemplate the immediate completion of a poultry farm on a scale beyond the experience of the farmer or one that will require more than the capital available. It is cheaper for the beginner to gain experience through making mistakes with a few rather than a large number of fowls.

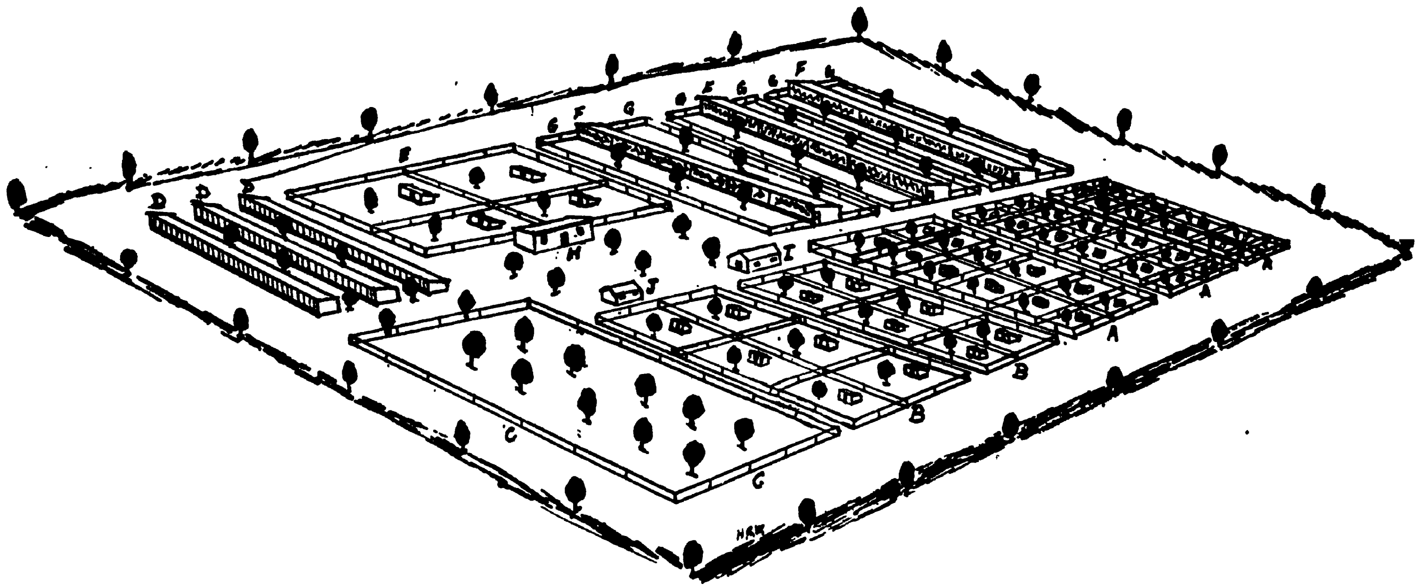
Of all matters associated with poultry farming, the site and houses are generally the first to be considered. These must also be regarded as important essentials from a health point of view, for fresh air and comfort are essential for the well-being of the birds. Suitable housing accommodation is required to protect the poultry from cold winds and rain, with ample fresh air at all times and reasonable protection when roosting. Fresh air may be obtained in the houses by suitable ventilation, without draughts blowing on to the

birds or overcrowding. Comfort may be secured by cleanliness and freedom from insect vermin; dampness must be prevented, and room allowed to enable the birds to move about freely when kept in confinement. If all poultry keepers would realise that it is not the contents of a bottle but sanitation and properly constructed houses that prevent common diseases, the health of the poultry would be more easily maintained. The aim should be to prevent rather than to cure disease.

Fowls require constant exercise to keep themselves healthy, and when they are confined in runs they must have sufficient room to furnish this exercise. More room is required in poultry houses when the fowls are confined all or part of the time than when they have free range the whole time. Sufficient exercising accommodation should be provided not only to maintain the health of the flock, but to prevent the birds taking on too much surplus fat and developing vices, such as feather eating. The environment is one of the determining factors for good health and profitable production.

The other factor for success and maximum egg production is efficient and regular feeding of the birds. These essentials go hand in hand, and successful commercial farming cannot be attained if either one or the other of these is neglected.

The housing and feeding of adult birds—that is, birds kept for commercial egg production or for breeding purposes—are quite different to those required for chicks and growing stock. The object of feeding adult stock is to produce eggs, maintain stamina and to compensate for the energy expended. In the case of young growing stock, sufficient food must be supplied to ensure constant growth in bone, flesh, fat, feathers, and to build up vigorous birds with strong constitutions that will mature naturally and lay standard size eggs. This is a point which many poultry keepers do not realise, and in consequence they frequently over-feed the adult stock and under-feed the growing stock. On the other hand, the main principles of housing apply to both, viz., the maximum of fresh air without draughts in the houses day and night, the provision of light, water-tight roofs and hard, dry floors.




PERSPECTIVE VIEW OF A BREEDING AND COMMERCIAL POULTRY FARM.

A, runs for growing chicks; B, breeding pens; C, camp for brooder chicks; D, single pens; E, pens for breeding ducks or turkeys; F, laying houses; G, duplicate runs to each house (F); H. store; I, incubator house; J, office.

Trees—fruit or ornamental. Area of land required—5 to 10 acres.

*Site.*—In selecting a site for the poultry houses and runs, three important points should be borne in mind: (1) Health of the birds; (2) convenience to the attendant, and (3) liability to vermin and other enemies.

A dry, porous soil, with natural good drainage, and if possible on gradually sloping ground towards the north, with shelter from the prevailing cold winds, present the main features to look for in the selection of a site. Such a soil is less liable to become tainted. A heavy, damp soil not only retains nearly all the droppings, but it retards the percolation during frequent rains and soon becomes fouled. This minimises the possibility of success and entails an enormous amount of labour and expense to keep clean.

The houses and runs should be built to give them a north-eastern, northern or north-western aspect, with the slope of the ground gradually falling away from the front and sides of the house. Poultry farmers should turn to good advantage all the protection they can secure in order to maintain a high standard of vigour and egg production. The birds should have access to the shade of trees when required. Fruit trees or ornamental trees should be planted in the runs for this purpose.

Economy in labour and time requires convenient appliances, and in no other undertaking is this better illustrated than in the poultry business, for whenever the work can be done conveniently it is less liable to be neglected. The work connected with poultry need not be burdensome, but constant attention is necessary. The mere fact that there are many details requiring daily attention makes it necessary to provide convenient utensils, houses and runs. A little inconvenience each day, or perhaps several times a day, will in time create possible negligence and unnecessary expense.

The lay-out of the houses, internal fittings and gates should be conveniently arranged to save as much labour and time as possible when attending the birds. A very high house will not afford proper protection during all weather, and a very low house is difficult to work in. The internal fittings to houses should be systematically arranged and made detachable—that is, feed utensils, nest boxes and perches. All gates should swing properly clear of the ground and be equipped with secure and convenient fasteners.

Convenience of access is of prime importance from a labour-saving point of view in arranging the construction of houses and runs or laying out a poultry farm. This will also afford protection from wild animals and other pests. In some localities hawks and poultry pests give trouble, and one must plan to meet these annoyances. Whenever animal vermin are numerous enough to give serious annoyance the houses should be securely built and have the front enclosed with strong netting wire, with a door to keep the inmates secure overnight. The poultry plant should be erected in close proximity to the other farm buildings, as this will tend to lessen the risk of marauders.

*General Construction of all Poultry Houses and Runs.*—The housing accommodation is the determining factor in the carrying capacity of the farm, but in addition to this, reasonable run space should be provided. Those who are starting poultry keeping should always have everything ready for the birds before their arrival. If not, the result will be makeshifts, and when once these have been introduced they are too apt to be retained, to the detriment of the birds. It is not necessary that the buildings should be elaborate in construction, but they should be durable and large enough to accommodate the required number of birds, and with perfectly smooth walls, without ledges or crevices in the interior. The front of the house should be open and covered with wire netting. Ventilation may be provided by an open space between the roof and back wall, or apertures 2 to 3 feet long by 6 inches deep, covered with netting wire or gauze, every 6 feet in the back wall of the house just below the eaves.

The most economical and preferable type of house is the combined house and scratching shed. By combining the two under one roof and providing dropping boards 2 feet 6 inches to 3 feet high from the floor, it is possible to get the maximum indoor exercising and sleeping accommodation. When a separate house and scratching shed are arranged it naturally follows that about two-thirds of the house is of little service during the night and of no service at all during the day. An outside apartment for scratching often proves very unsatisfactory in the rainy season. The general principle is to have a sufficiently wide dropping board along the back wall of the house 4 inches below the perches. The nest

boxes and food utensils should be placed at a convenient height, so that the whole of the floor is available for use as exercising accommodation. This principle applies to both small and large houses. If desirable, the dropping board can be substituted by a space on the floor running lengthwise under the perches, or a sleeping apartment portioned off and kept free from litter by a dwarf wall 18 inches high to facilitate cleaning, the remaining portion of the house to be used as a scratching shed. By this method of arrangement less floor space is available for exercising and reduces the carrying capacity of the house in the wet season.

*Material and Design.*—There are many opinions as to the best material to use in the construction of poultry houses, for nearly everything has its advantages. Any material, therefore, can be recommended which the poultry-keeper finds easiest and cheapest to obtain, provided the houses are well constructed and durable. The following materials may be used:—*Pisé de terre,* burnt brick, Kimberley brick, wood, corrugated iron, pole and dagga and grass.

*Pisé de terre,* 6 inches to 9 inches thick, plastered inside and outside and given a good coating of tar, and limewashed, is an ideal material giving a very even temperature —cool in summer and warm in winter—and with no sudden rise during the day or fall at night. The same applies to ordinary burnt brick and Kimberley brick. Care should be exercised in the plastering to eliminate all cracks in which insect vermin, especially fowl ticks, can find harbourage. Wood in this country is usually too expensive, and it is difficult to obtain well-seasoned native timber. This material is more suitable for the construction of portable colony houses.

Corrugated iron houses are considered suitable, provided they are well ventilated at the eaves and not too low in construction. The roof should be covered with a layer of grass or sunflower stalks to ensure as even and cool a temperature as possible. Pole and dagga and grass houses may be considered temporary structures requiring frequent renovating. Houses built of these materials are cheap, but the construction must be well done and the former should be well plastered. Grass houses should be covered inside with wire netting to prevent cats and other wild animals obtaining ingress. The material used for the roof will naturally be

either iron or thatch; the latter is suitable, provided it is water-tight. It will, however, require frequent renewing or renovating. In the construction of poultry houses a certain amount of wood has to be used for the framework and doors, and whether a house is built of iron or any of the above-mentioned materials, the quantity of wood is practically the same, all of which should be painted with a tar preparation as a preservative and to eliminate insect vermin.

*The Design.*—The design of all permanent poultry houses should be of the lean-to pattern, with open wire front and a dwarf wall 18 inches high running the length of the front of the house, the roof sloping from the front to the back. The roof might be advanced 6 inches beyond the sides and back of the house, projecting 18 inches to 2 feet in front in a downward angle, forming a verandah; this will prevent a great deal of rain from driving into the house. The lean-to type of roof is desirable for small or large houses when corrugated iron is used for the roof. In the case of thatched roofs for large houses, either the apex-shaped or uneven span type of roof is recommended. These types are substantial, and it is possible to obtain the necessary pitch in the roof to carry off the rain water readily. In hot localities also this type will be found cooler, as more head room can be provided. Houses for poultry should have sufficient height inside for the attendant to move about easily, and as a rule 7 feet is the average height at the highest point. Sufficient light and good ventilation can be obtained in large houses by making them relatively long and narrow. Small houses should be made as square as possible.

The size of the houses required will depend largely upon the number of birds to be accommodated and the purpose for which they are to be used; as a general rule 3 to 4 square feet of floor space should be allowed for each bird. Three square feet should be allowed for the medium and small-sized breeds. The advent of the large laying house has made commercial poultry farming an economical and practical proposition, both by greatly reducing the cost of labour and by accommodating a much larger number of birds in a given area.

*The Floor.*—This is another important factor which requires consideration, for upon it depends greatly the health

and productiveness of the birds. Damp floors cause damp litter. If soft and dusty, it will be difficult to keep clean and will form an ideal breeding ground for fleas, and the poultry farmer would find that, no matter how often fleas may be eliminated from the heads of the birds, others would take their place. If the floor is not above the level of the surrounding ground outside it would probably be damp during the wet weather, and a damp floor is a precursor of diseases of all kinds. The floor should therefore be made of hard material, such as concrete or grouted bricks, without cracks, and elevated not less than 4 inches above the ground outside. It should be covered with litter, such as straw or dry leaves, to a depth of 6 to 12 inches. Floors made of ant-heap with tarred surface are more suitable for portable colony houses.

*Runs.*—The size of these is immaterial in the semi-intensive system; they are only necessary for the birds to dust-bath and to obtain additional fresh air or sunshine, and not intended for exercising, which is obtained by scratching in the litter inside the house. The size of the runs or range required for any given number of fowls depends on the method by which they are to be kept. Very large runs are not desirable under ordinary conditions. Duplicate runs are recommended for permanent semi-intensive poultry farms. As an example for small houses, take an enclosure of 50 feet by 25 feet, sub-divided in half, and a house placed in the centre of the dividing fence, or for large houses a run at the back and front of the house, utilising one-half for three or six months, then resting it and growing a green crop to cleanse the ground while the other half is being utilised by the birds, thereby keeping the birds on clean ground at all times. The house in this case may contain two or more exits (trap doors) to both runs, which may be opened or shut alternatively, according to which run the birds occupy. Whether the runs are large or small, they must be cared for in a manner to ensure cleanliness.

*Fences.*—Wire netting 6 feet high should be used and must be fastened down and buried 6 inches below the surface of the ground. This will prevent the birds gaining exit underneath. The posts should be made of durable wood or of iron. If wooden posts are used, the lower part of them

3 feet from the base should be coated with tar. Heavy posts must be used at the corners and ends of the fence, and these posts should be well stayed. Iron fencing standards or old boiler tubes are often used for permanent fences. It is highly necessary to provide shade in the runs. There should be plenty of sunshine and some shade in all the runs. For this purpose the shade of trees is the best. A grass shelter on four uprights makes an excellent substitute and should be at least 4 feet in height.

Having dealt in a general way with poultry houses and runs, those most suitable for different classes of poultry farmers from the one who has only a small plot at his disposal to the plant necessary for a large egg farm will now be described.

*Suburban House and Run.*—There is no need for a back yard poultry house to be an eyesore to the public, nor is there any reason why any prospective poultry keeper should forego a few laying fowls in the back yard on account of the vegetable garden. Often one hears the remark, "It is impossible to keep a garden and fowls." Those who are fortunate in having a vegetable garden or a plot of ground adjoining their homestead can not only work a garden and keep fowls together, but the birds can be given an absolute fresh run four times a year, at the same time increasing the productive value of their ground. The following is an ideal system of keeping a few fowls for the small holder with a limited amount of ground at his disposal and who desires to keep a garden. A house 6 to 8 feet square is recommended which will accommodate from 12 to 15 birds respectively; the front of wire netting, with 18-inch boarding the whole length of the front to keep in the litter. There should be a door 2 feet 3 inches wide in the front, consisting of a light wooden frame covered with wire netting, and at the back of the house and both sides a sliding trap door should be provided just above the level of the litter; these should fit closely to prevent any draughts. The plot of ground or garden should be surrounded with wire netting, in the centre of which is placed the house, and from each corner of the house a length of netting is extended to meet in a straight

line at the opposite sides of the run (Fig. I.). There will now be four pens, in each of which the birds can run alternately for any suitable period, one run being occupied by the birds while the others are carrying crops of vegetables or flowers. The manure of the fowls and the aeration of the soil caused by scratching tend to produce excellent crops

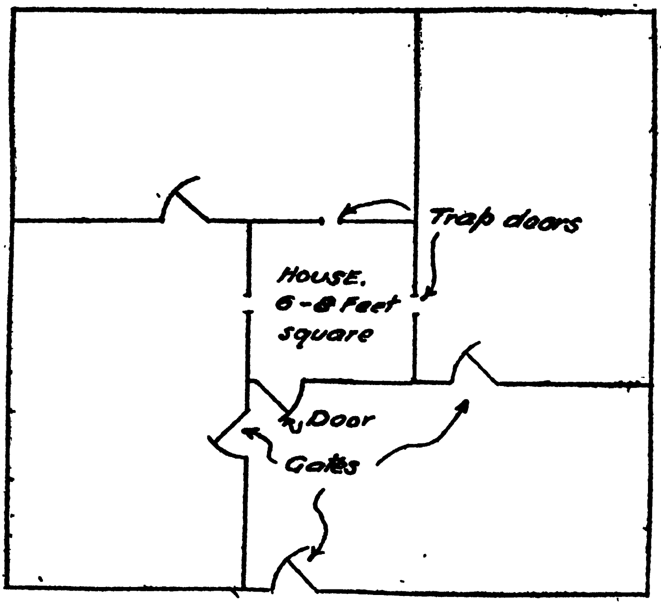



Fig. I.
Suburban house and run.

free from insects and grubs, and the fact that they have absolutely fresh ground at least four times a year, together, of course, with proper care and attention to cleanliness, keeps the birds in excellent health and helps to produce a good egg yield. It is not suggested that any attempt should be made at hatching and rearing chicks under these conditions. The trouble entailed and the limited space available do not allow of it to any extent or with any marked success. It will pay better to cull out the birds each year just before they commence to moult, replacing them by the same number of pullets of the same breed, for it is advisable to keep one breed of a good laying strain only. Under these circumstances, to keep a male bird would be a waste of money in feeding and waste of room, for another layer could be kept in his place. The

general idea that birds will lay better when a male is running with them is quite a fallacy; in fact, they lay better as a rule without one. The suburban house may be built of brick or any description of packing cases, which could be coated with creosote, solignum or other tar preparation. This would make the wooden structure durable and a nice dark colour that will tone with any surroundings. A few feet of zinc or other roofing material suitably fastened on the roof makes the top water-tight. The house will be better protected by having an overlap in the roof at the back, sides and front. A wire netting front and door are necessary in order to confine the birds during wet weather, to ensure safety at night and to catch the birds more easily when required to do so. The floor should be cemented for preference, over the whole of which a good depth of litter or dry leaves should be placed. Absolute cleanliness is necessary at all times. Supply plenty of green food and fresh water, bury all grain in the litter and, above all, do not overcrowd.

*Breeding Pen Houses.*—Continuous or separate houses may be built (Fig. II.). Attached or continuous houses should be 8 feet to 10 feet deep, divided with solid partition walls every 10 to 12 feet respectively, with a wooden door 2 feet wide in the back wall at one end of each compartment. If separate or detached housing methods are adapted for breeding stock, a house 8 feet square (inside dimensions) is sufficient to accommodate a breeding pen of twelve birds, and, given two or three perches and a dropping board, will give ample perching and accommodation for exercise. The house should be of the lean-to pattern, 6 feet high in front and 5½ feet at the back if the roof is of corrugated iron. The walls can be made of brick or any other suitable material at the disposal of the poultry keeper. If the roof is thatched it will be necessary to increase the slope from front to back in the lean-to type, or the apex or uneven-span types of roof may be constructed with advantage over deep houses. The best position for the door in separate houses is in front, made of a light-wood frame covered with wire netting. An open wire-fronted house will admit ample fresh air day and night and sunlight during the day. When a number of breeding pens are required it is more economical to construct long houses which can be suitably divided off, according to the number of pens required. It is recommended that the

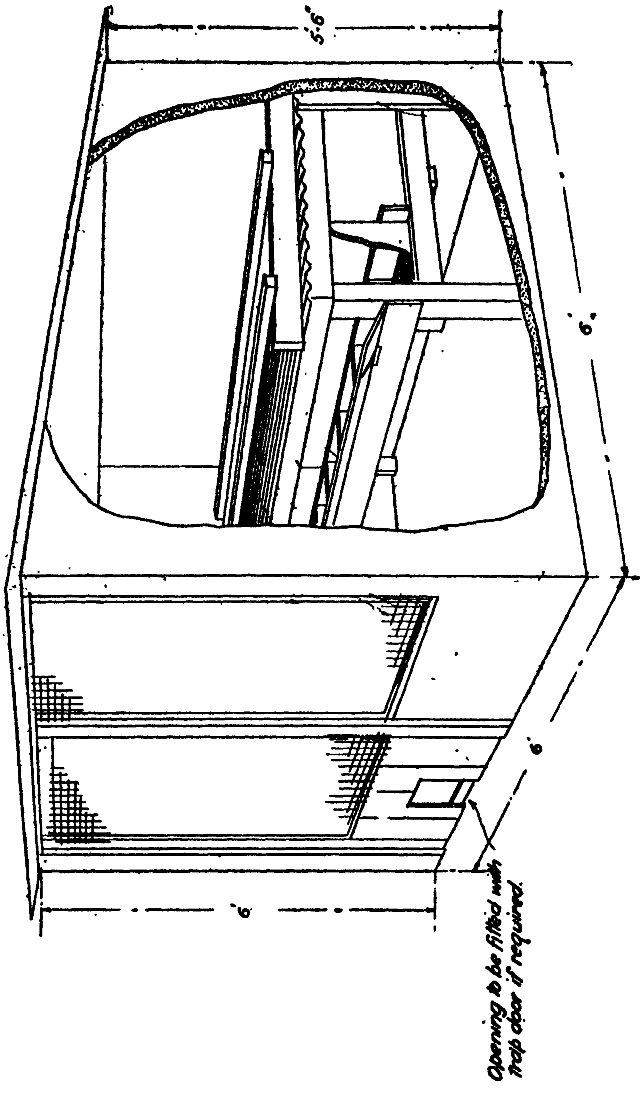



Fig. II.

Breeding pen, showing arrangement of nests, dropping board and perches.

breeding stock be kept on the semi-intensive principle, and runs must therefore be provided, which may be large or small, as the circumstances require.

*The Laying House.*—This may be any size from 15 feet in length, built on the same principle as the breeding pen houses. The house may continue unbroken for a considerable length, with wire netting partitions as required, or individual houses may be built in rows, each to accommodate a given number of birds. Both of these principles have been adopted in Rhodesia and have proved satisfactory. There are some houses at present over 100 feet long, accommodating 450 birds. As a general rule a house 15 feet long should be 8 feet deep, but no house, however long, should be more than 14 feet deep, 8 feet high in front and 6 feet at the back. To prevent a draught sweeping through large houses from end to end it is necessary to provide solid partitions every 30 feet. Each alternate partition should be extended from the back wall to the front, the others to be long enough to reach 2 feet 6 inches in front of the dropping board. This will protect and give comfort to the roosting birds at night. By providing apertures in the back wall below the eaves, good ventilation will be secured.

*Colony Houses.*—The term colony house is frequently applied to any buildings used for separate groups or flocks of poultry. A colony house proper is one that is placed by itself in a field or orchard where the fowls have free range or partial freedom in small flocks. Colony houses may be stationary or portable. Stationary colony houses may be narrow from front to back, as such houses are used only for sleeping accommodation. A house 7 feet wide by 12 feet long, 6 feet high in front and 5½ feet at the back, will accommodate twenty-five adult birds.

Dropping boards are not generally used in houses of this type, the floor underneath the perches being covered with sand. Colony houses of this kind are better suited to farms where the fowls have large runs in an orcharl or when it is desired to keep them under control in large paddocks.

Any style of house that is not too heavy can be made movable either by carrying it or placing it on runners or sleighs. Such a house may be made of corrugated iron, wood, grass or other roofing materials. The framework in all cases

should be strong. Houses of this type can be used as brooder houses for young chicks, as colony houses for roosters, for maturing pullets and for laying hens on range. When it is desired to move these houses they can be easily drawn or carried from one locality to another. These houses may also be built in sections, which are bolted together, as they can be conveniently dismantled in sections when required to move them. Whenever a large number of birds are housed by means of the colony system, the houses should be made portable, so that the whole plant can be moved; it is often desirable to transfer the houses from one place to another.

*Internal Arrangements.*—The interior arrangements of all poultry houses should be simple, convenient, easy to clean and detachable. The same arrangement can apply to almost all the houses, the only difference being that the requisite number of nests, perches and feed utensils should be supplied to the number of birds accommodated. In some localities it will be found advantageous to equip open-fronted houses with curtains or hessian-covered frames, which can be closed in cold weather. Coarse material is necessary to permit circulation of air. If curtains are used they should be securely fastened at both ends to prevent unnecessary flapping and disturbance to the birds.

*Nests.*—One nest should be provided for three hens. Nests should be roomy and at least 13 inches square to meet all requirements. They may be made singly or in rows and fastened to the side of the building, elevated from the floor or placed in front but under the dropping boards. The entrance to the nests should always be secluded, as the hens will readily seek the nests so placed and are less liable to acquire the habit of egg-eating. This will also tend to prevent them from laying in the litter outside the nests. Arrangements should be made for convenience in gathering the eggs.

*Roosts.*—Roosting is a natural habit of fowls at night and is quickly acquired by chickens. The example set by one or two hens kept with them will soon teach them to roost when required to do so. When chickens are drafted from coops to houses in large numbers they are generally apt to crowd together in the corners of the houses and suffocate the weaker ones. It is advisable at this stage to allow the

robust chickens to roost when they want to and thus relieve the overcrowding. Chickens of the light breeds will often show a tendency to roost at eight to ten weeks old, and wide perches may be provided for them for roosting, but they should not necessarily be encouraged to do so without particular reason. The breastbone of chickens is likely to become bent if they are allowed to roost too early, especially on narrow, round perches. The perches for chickens should be flat and not less than 3 to 4 inches in width—the length of the breastbone. Well-grown chickens of the light breeds are allowed to roost with safety when three to four months old and the heavy breeds when four to five months old. The dropping boards must be covered on top with sand half an inch in depth and should be 2 to 3 feet wide, according to the number of perches required. They should extend the whole length of the back wall 2 feet 6 inches to 3 feet high from the floor, and projecting 6 inches beyond the front perch. The perches for adult stock should be 2 by 3-inch material, with the broad side up and the corners slightly rounded off. All perches should be placed on the same level and fixed in slots 4 inches above the dropping board. They should be placed lengthwise or parallel to the back wall, the first perch being 15 inches from the wall and the second and successive perches 13 inches between each. The number of perches required will be determined by the number of birds to be accommodated. It is, however, sufficient to allow 8 inches of perching per bird for light breeds and 9 to 10 inches for the general purpose and heavy breeds.

*Litter.*—The floor of the poultry house should be kept dry and covered with litter not less than 6 inches deep at all times. The residue after threshing oats, wheat or rye makes the best litter, but if it cannot be obtained, veld grass, dry leaves or sawdust may be used. As soon as the litter becomes damp, badly soiled or very fine, it should be taken out and replaced by fresh, dry litter.

*Broody Coops.*—An anti-broody coop is indispensable where the general purpose or heavy breeds are kept. For convenience a coop may be placed at both ends of large laying houses 4 inches above the dropping board, consisting of a wooden frame enclosed with wire netting and having a slatted bottom, for confining broody hens.

*Dust Bath.*—Fowls will wallow or sun themselves in dry or damp earth to clean themselves and free their plumage and bodies from insect vermin, and for this reason the dust bath may be regarded as a bath tub for fowls. If fowls are not provided with runs or free range they must be supplied with a box containing earth. Dust bathing is an absolute necessity and is the natural method for all birds to keep themselves free of lice. If deprived of all means for dust bathing, the confined or isolated birds have no means to rid themselves of their insect enemies, and they must either be dipped or dusted with insect powder by the attendant. Dry or damp, clean, loose earth is all they require. Damp earth is preferable, as it is more efficient in removing the lice and it is less dusty. It must be dry enough, however, to penetrate through the feathers to the skin.

*Catching Crate.*—When it is necessary to catch or handle laying birds for the purpose of culling, grading or transferring them from pen to pen, a catching crate is an indispensable and convenient labour-saving device (Fig. III.). The coop should be 5 feet long, 2 feet 4 inches wide and 3 feet high (outside dimensions), consisting of a wooden frame enclosed with wire netting and a boarded floor. A sliding door should be provided at one end and two hinged wire doors on top. In using the coop, the side with the sliding door is placed firmly against the trap door exit of the poultry house; the birds are then quietly driven or encouraged into the coop, and when full the sliding door is closed. If the birds are to be moved to another pen, the crate is then carried to the place desired. When birds are handled individually they may be withdrawn one by one through one or the other of the hinged doors on the top of the crate.

*Care of Utensils and Equipment.*—Care and attention must be given to all equipment. The utensils, perches and floors of the houses must be kept clean and disinfected to prevent red mite, fleas and failure caused by insanitary environment. Water vessels should be regularly cleaned and the drinking water kept in the shade at all times; it should not be allowed to become contaminated by filth of any kind. Sun-warmed water is likely to cause bowel trouble. Dirty perches and food utensils will become a breeding spot for all kinds of disorders and insect pests. The nest boxes, perches and other woodwork should be painted with some tar

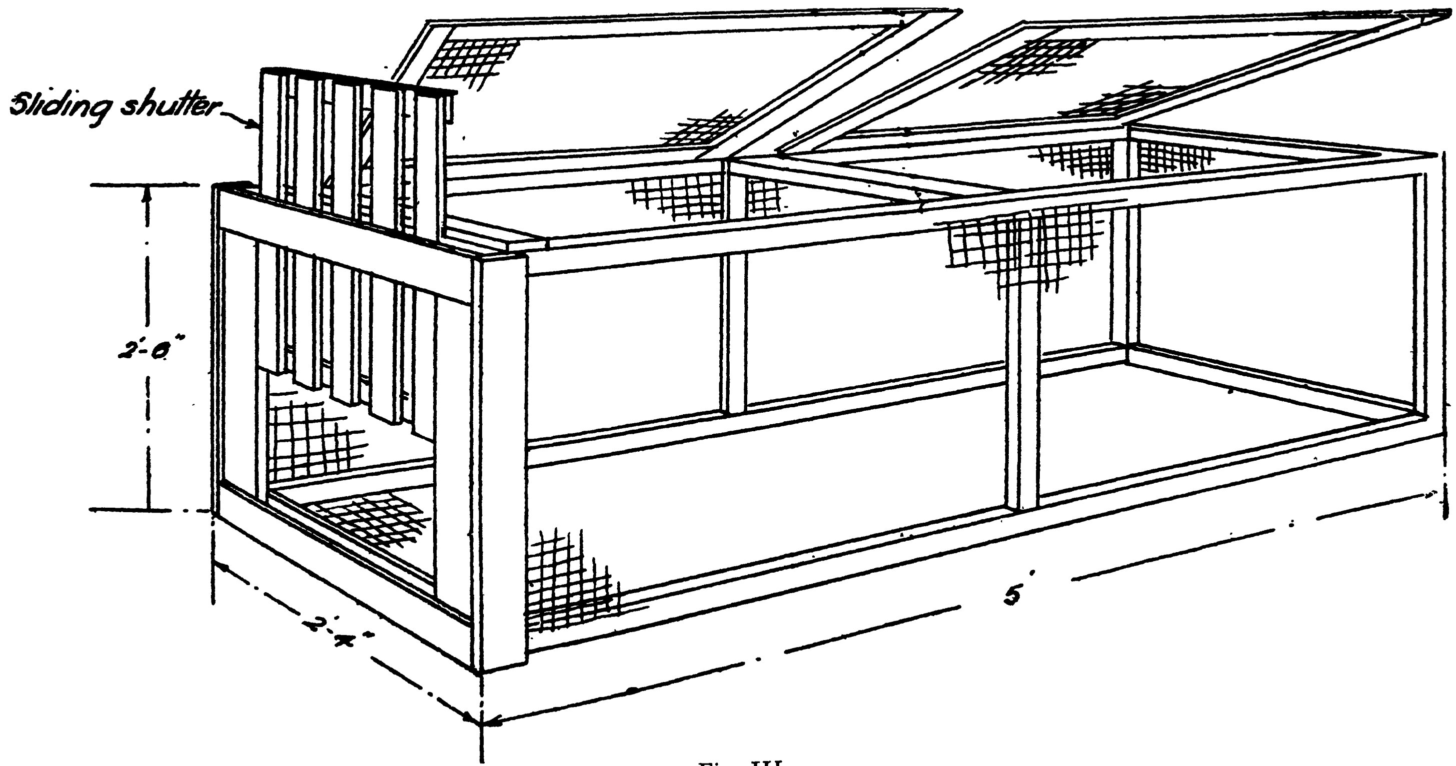



Fig. III.
Catching crate.

preparation at least once a year. The dropping boards should be cleaned daily whenever possible; an accumulation of dirt and manure should never be permitted inside the house. It is a good practice to dust and whitewash the walls of the houses twice a year and disinfect the floor. In all cases the houses and runs should be as clean and neat as possible, for nothing looks worse and is less conducive to productiveness and health than dirty, untidy houses and runs, standards crooked, wire netting uneven and sagging. It has always been observed that the houses and runs of successful and progressive poultry farmers are the essence of neatness and cleanliness. All utensils for milk, water and mash should be simple, neat and clean. Excellent ones can be made from petrol tins and boxes at little cost.

There are three general systems of poultry farming—they are the intensive and semi-intensive systems and the extensive or free range system.

*The Intensive and Semi-Intensive Systems* have improved considerably within recent years, by which much larger numbers of laying birds can be kept together than were formerly thought possible. They are kept in large flocks or units numbering from 100 birds in one flock, in well-built, airy, light houses, well littered and made attractive to the birds in every way, so much so that they spend the larger portion of their time indoors, exercising themselves by scratching in the litter for the grain food therein. They use a small outside run intermittently for green food, dust bathing and outdoor exercise, but seldom wander far from what to them is the centre of their existence—their own particular laying house. Different views prevail as to what constitutes the most economical unit; in other words, what is the most efficient number of birds to put in one flock. There are many flocks which are composed of 100 to 500 birds and even more. Best results are obtained when the flocks are not too large.

*The Free Range or Extensive System* of poultry farming is adaptable particularly in grain and fruit-growing districts, under which system the birds are provided with portable houses and given entire liberty or free range. This system cannot be advocated for large commercial egg-laying flocks unless the free ranging conditions are ideal. It is question-

able, even with favourable conditions, whether this method is economically sound in Rhodesia. The disadvantages may be said to outweigh the advantages, as an otherwise profitable flock of layers may be rendered unprofitable through exposure and mortality and loss of eggs from various causes. Young growing stock intended for future breeders or the laying house should have ample well-shaded grass range and given the necessary care and feeding. Portable apex houses are suitable for birds on free range. An apex house 8 feet by 12 feet will accommodate 50 growing birds. The houses should be located at convenient distances apart, and if proper care is taken at first to accustom them to their own house, the different flocks will give little trouble by mixing up at night. Where the birds can have access to an orchard, narrow houses 6 feet to 8 feet deep may be used with large wired-in runs. Flocks composed of 100 birds will keep an acre of land in a high state of fertility. Any plan which gives the growing stock the freedom of arable land, grass land or orchard is favourable, provided the birds are safe, well fed and can be kept under control and not able to find poisonous weeds and seeds.

The question of feeding will be dealt with in the next issue of the Journal.

(*To be concluded.*)

# Notes on the Exhibit of Water Culture Solutions

BY THE DIVISION OF CHEMISTRY AT SALISBURY SHOW.

The great interest shown in the series of plants grown in water culture solutions on the Division of Chemistry exhibit at the Salisbury Show has prompted the writing of these explanatory notes.

It has long been known that ten chemical elements are necessary for healthy plant growth. These are carbon, oxygen, hydrogen, nitrogen, sulphur, phosphorus, calcium, potassium, magnesium and iron. Of these, nitrogen, phosphorus and potassium are termed the essential manurial ingredients, as they are most liable to exhaustion by the removal of crops. This is due to the fact that these elements occur in larger amounts than the others in most plants, and are present in smaller amounts in most soils.

The object of this experiment was to demonstrate the need of plants for these three elements and to show how each played its part in the growth of the plant. Briefly, the function of these elements is as follows:—

*Nitrogen.*—The effect of nitrogen is shown in the development of leaf and stem. Stunted growth and yellowing of the leaf indicate nitrogen deficiency.

*Potash.*—This element may be regarded as a tonic. It increases the resistance of the plant to bad weather conditions and disease and favours the formation of starch.

*Phosphorus.*—Phosphorus promotes root development and later contributes towards seed formation. It also hastens maturity.

**Examination of Illustrations.**—The first photograph shows broad bean plants in a variety of culture solutions. The second is of maize plants in a similar series of solutions.

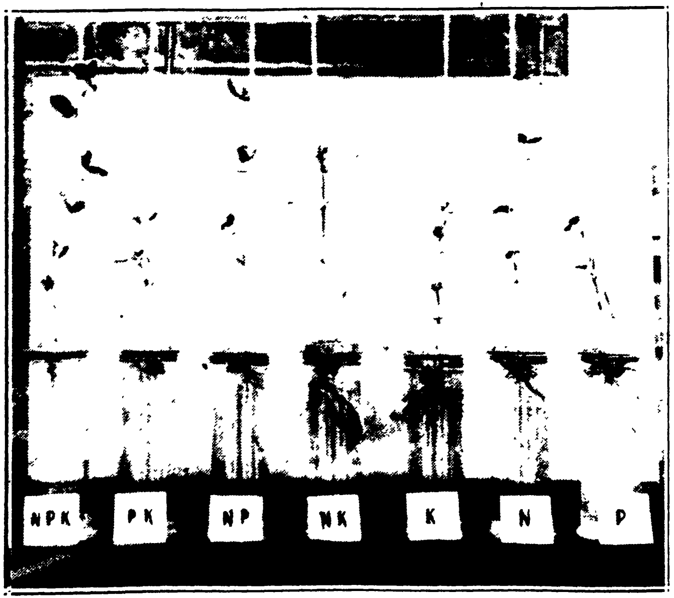



Fig. I. Broad bean plants in a variety of culture solutions.

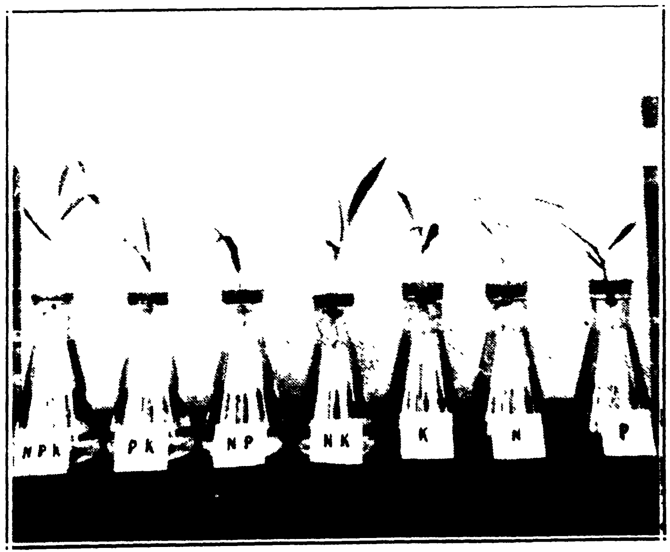



Fig. II. Maize plants in a variety of culture solutions

It is regretted that owing to the reflection from the sloping sides of the flasks in the second photograph the root systems are not clearly seen. It is advised, therefore, to follow the remarks from the first photograph.

N = Nitrogen; P = Phosphorus; K = Potash.

The flask on the left of the photograph marked N.P.K. shows a plant growing in a complete culture solution. In addition to the three essential constituents, this solution contains the other elements necessary for healthy growth. It is readily seen that the plant is well developed in every respect; its stem and leaves give evidence of vigorous growth and its roots are healthy and almost fill the flask.

The other solutions contain all the minor elements necessary for plant growth, but only one or two, as the case may be, of the three essential elements as marked on the photograph. An examination of these in comparison with the complete solution shows the effect of the absence or presence of any one element.

*Nitrogen.*—The presence of nitrogen is shown in the strong growth of leaf and stems in Nos. III., IV. and VI. (numbering from the left). Its absence is marked by the stunted growth in Nos. II., V. and VII.

*Phosphorus.*—The effects of phosphorus are to be seen in the root development, which is well exemplified in Nos. II., III. and VII. Its absence is shown in the poor root development in Nos. IV., V. and VI. No. VI. in particular indicates that although a plant may show good growth due to nitrogen, yet its root development may be very poor. Such a plant could not hope to withstand adverse conditions.

*Potash.*—It is difficult to recognise the effects of potash from a photograph, and in this case it is best seen by comparing Nos. II. and III. Both have phosphorus present; in addition, No. II. has potash and No. III. nitrogen. The potash is responsible for the finer and healthier roots of No. II.

A general comparison of No. I. with the remaining six shows it to be markedly superior in root and stem development, and in general it has a healthier and more vigorous growth.

From a study of these photographs it is at once apparent that each manurial ingredient contributes its share to the growth of the plant, and that it is necessary to have sufficient of all three present before the best results may be expected. A surplus of one will never make up for a deficiency of another.

# Seeds for Sale, Gwebi Farm.

| | | s. | d. |
|---|---|---|---|
| Salisbury White Maize, Tips and Butts, per bag of | 200 lbs. | 17 | 0 |
| Kherson Oats ... ... ... ... ... ... ... ... ... ... ... | 100 lbs. | 26 | 0 |
| Kinvarra Oats ... ... ... ... ... ... ... ... ... ... ... | 100 lbs. | 26 | 0 |
| Ground Nuts (Spanish Bunch in shell) ... ... | 75 lbs. | 18 | 3 |
| Boer Manna ... ... ... ... ... ... ... ... ... ... ... ... | per lb. | 0 | 4 |
| Majorda Seed ... ... ... ... ... ... ... ... ... ... ... ... | per lb. | 1 | 1 |
| Sunflower Seed (Large Black) ... ... ... ... ... | 100 lbs. | 16 | 0 |
| Sweet Potato Tubers (Calabash Leaf) ... ... | 150 lbs. | 11 | 0 |
| Sweet Potato Slips ... ... ... ... ... ... ... ... ... ... | per bag | 6 | 0 |
| Napier Fodder Roots ... ... ... ... ... ... ... ... ... | per bag | 6 | 0 |
| Edible Canna ... ... ... ... ... ... ... per 100 | "tubers" | 9 | 0 |

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

# Maize on the Sand Veld.

## TABULATED RESULTS FOR SEASON 1928-29.

By The Division of the Chief Agriculturist.

Due to force of circumstances during the last year or two much greater attention has recently been paid to the growing of maize on sand veld farms all over the country. There still appear, however, to be many farmers who doubt the possibilities of the sand veld as potential maize producing land. For this reason the following tabulated results have been collected from sand veld farmers, widely distributed throughout the Colony, from Bulawayo on the one side to Inyazura on the other. These returns give some idea of crop prospects on the light sandy soils of Southern Rhodesia when intelligence and industry are brought to bear on the business.

As will be seen, no unreasonably heavy dressings of fertilisers or farmyard manure were used, and yet excellent yields of maize were obtained, which compare well with the crops obtained by farmers on the heavier red maize soils of the Colony.

Besides maize, it is well known and has repeatedly been demonstrated that crops such as ground nuts, sunflowers, sweet potatoes, cowpeas or kaffir beans, velvet beans, Sunn hemp and dolichos beans grow excellently on sand veld soils, provided the land is properly prepared and the crops are well cultivated and cared for. As well as the above-mentioned crops, winter cereals and several valuable pasture grasses can be grown better on wet sandy vlei soils than on heavier land. With such a wide range of summer and winter crops that can be grown successfully on the lighter soil, the future

of these sections of the Colony for mixed farming is assured under a properly planned and executed system of land management. The system should include a well designed rotation of crops combined with animal husbandry, and the production and use of farmyard manure aided by recourse to green manuring and artificial fertilisers as may be found necessary.

Despite the above statement, a note of warning should be sounded with regard to sand veld soils. All sandy soils are not equally fertile. Some are of very low fertility and others are extremely shallow and readily become waterlogged in wet seasons, and so are generally unsuited for crop production. Naturally, care must be taken to select for arable farming those areas on each property, which offer the best prospects of success.

It is on sandy soils of this better character that the results given below were obtained during the season 1928-29, which was not climatically, by any means, a perfect one.

A suitable rotation of crops is most important in the management of these soils, and farmers situated in such areas are cordially invited to make full use of the officers of the Chief Agriculturist's Division for the planning of rotations suitable to each individual's needs.

## MAIZE ON SAND VELD.—TABULATED RESULTS.

| Area. | Previous cropping and treatment of land. | Type of soil. | Treatment, 1928-29. | Method of planting and date. | Area of land under maize (acres) | Yield in bags per acre of maize. |
|---|---|---|---|---|---|---|
| 1. Selous | 1 year tobacco + 200 lbs. d/c tobacco fertiliser | Grey sand | ... | By machine | ... | 11.0 |
| 2. Rusape | Land broken February, 1927; 1 year tobacco + 150 lbs. 18 : 6 : 8 fertiliser per acre | Dark grey sand | ... | Planted in early November | 5 | 19.0 |
| | 2 years tobacco + 150 lbs. d/c first year and 150 lbs. 18 : 6 : 8 fertiliser second year | do | ... | Planted in October, ten days before rain fell | 40 | 12.0 |
| | First broken September, 1928 | Dark and light grey sand | 500 lbs. lime per acre | Planted November, 1928 | 25 | 4.0 |
| 3. South Salisbury | 1 year tobacco + 260 lbs. 18 : 6 : 8 fertiliser | Sand | 2 double hands full k/m per "hill" | Check-row by hand at 36 ins. × 36 ins., 2 plants per "hill" | 12 | 9.0 |
| 4. Banket | 2 years tobacco + fertiliser | Sand | ... | Planted 1st to 7th December | 25 | 9.5 |
| | Ditto | ... | 150 lbs. b and s | Planted last week in December | 12 | 10.0 |
| 5. Beatrice | (a) 2 years cotton 2 years tobacco + fertiliser | Light sand | 2 double hands full k/m per "hill" and 400 lbs. superphosphate per acre | Check-row by hand at 3 ft. × 3 ft., 2 plants per "hill" | 2 | 16.5 |
| | (b) Ditto | ... | Part 200 lbs. superphosphate, part 200 lbs. b and s per acre | ... | $11\frac{1}{2}$ | 17.0 |
| | (c) 1 year tobacco 1 year green manure | ... | K/m at above rate + 200 lbs. superphosphate per acre | ... | $2\frac{3}{4}$ | 17.7 |

## MAIZE ON SAND VELD.—TABULATED RESULTS (*continued*).

| Area. | Previous cropping and treatment of land. | Type of soil. | Treatment, 1928-29. | Method of planting and date. | Area of land under maize (acres) | Yield in bags per acre of maize. |
|---|---|---|---|---|---|---|
| 6. Banket | (a) 2 years tobacco + 120 lbs. 18 : 6 : 8 fertiliser | ... | ... | ... | ... | ... |
| | 1 year maize, no fertiliser | Red sand | 150 lbs. b and s | ... | 12 | 15.0 |
| | (b) 1 year tobacco + 150 lbs. 18 : 6 : 8 fertiliser<br>1 year fallow<br>1 year maize + 150 lbs. b and s | do | 200 ,, ,, | ... | 12 | 12.0 |
| | (c) 2 years tobacco + 150 lbs. 18 : 6 : 8 fertiliser | do | 150 ,, ,, | ... | 15 | 15.0 |
| | (d) 2 years tobacco + 120 lbs. 18 : 6 : 8 fertiliser | do | 150 ,, ,, | ... | 39 | 17.0 |
| | (e) 1 year tobacco + 150 lbs. 18 : 6 : 8 fertiliser | do | 160 ,, ,, | ... | 18 (6 new land) | 8.0 |
| 7. Iron Mine Hill, Gwelo | (a) 10 acres new land + 12 tons k/m per acre | Grey granite sand | ... | ... | 30 | average yield 8.0 |
| | (b) 10 acres : 1 crop maize + 12 tons k/m per acre | do | ... | ... | | |
| | (c) 10 acres : 1 crop maize + 12 tons k/m<br>1 crop maize, no fertiliser | do | 10 acres 150 lbs. d/c maize fertiliser | ... | | |
| 8. Bulawayo | 1 year tobacco + fertiliser<br>1 year cow pea hay, ground nuts and maize | "Gusi" sand | 100 lbs. d/c maize fertiliser per acre | ... | 50 | 15.6 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9. | Rusape | (a) Old land, previous crops unknown by owner — 1 year maize + 200 lbs. b and s | Light sandy loam | Medium dressing k/m | 36 ins. × 24 ins., by hand, underplanted with melons. Stand 75%. Planted 13th November | 12 | 10.4 |
| | | (b) Ditto | Red contact | 200 lbs. b and s | Planted by machine at 36 ins. × 14 ins. Stand 65%. Planted early December | ... | 8.1 |
| 10. | South Salisbury | 1 year tobacco + 200 lbs. fertiliser per acre<br>1 year ground nuts (no treatment)<br>1 year cotton (no treatment) | Grey sand, 4 ins. deep | ... | Machine planted, 12th November | 12 | 7.75 |
| 11. | Inyazura | (a) 2 years tobacco + 200 lbs. Peruvian guano tobacco fertiliser per acre | Good sandy loam | ... | Planted by hand in November on ridges 2 ft. 6 ins. apart —1 seed at 3 ft. on ridges. Stand 95% | 8 | 13.75 |
| | | (b) Ditto | Granite formation | ... | Ditto | 12 | 11.0 |
| | | (c) 2 years tobacco + 150 lbs. d/c tobacco fertiliser | ... | ... | 3 ft. × 3 ft. by hand —1 seed per "hill," planted flat, but ridged later | 20 | 8.0 |

N.B.—In the above, 18 : 6 : 8 fertiliser = No. 4 tobacco fertiliser (bloodmeal)—18% phosphate, 6% nitrogen and 8% potash.
d/c = double complete.
b and s = bone and superphosphate.
k/m = kraal manure.

# Maize on the Sand Veld.

## RESULTS AT THE TOBACCO EXPERIMENT STATION, SALISBURY.

By C. A. KELSEY-HARVEY, Manager.

*(Published with the authority of the Chief Agriculturist.)*

The following is a report of certain experiments with maize carried out on this station last season, 1928-29:—

### Experiment No. 1.

A preliminary investigation in order to observe the influence on the growing maize crop of under-planting it with a leguminous crop, later to be ploughed under or fed off, combined with tests to ascertain the best time of sowing the under-planted crop and the most practical and economical method of doing so.

Cowpeas or kaffir beans were selected as being the best suited crop for the under-planting of maize on sandy soil. As will be seen by referring to the table given below, four half-acre plots were chosen for this experiment, the maize being planted in check rows by hand on the 20th December, 1928, 3 feet apart each way, four seeds to a hill; later thinned down to two plants per hill. The land was fertilised in November with 150 lbs. per acre of bone and superphosphate.

The field had been under tobacco during the two preceding seasons, the tobacco being treated with 200 lbs. double complete tobacco fertiliser per acre the first year and 150 lbs. blood meal tobacco fertiliser per acre the second year.

As soon as the maize was established in plot No. 1 the cowpeas were sown by hand in the same rows as the maize plants, to permit of subsequent cultivations. This method of planting was also followed on plots No. 2 and No. 3, where

Fig. I. 15 bags 47 lbs. per acre of maize.
Cowpeas planted by hand in row between maize plants when maize was well established and about 4 to 6 inches high.

Fig. II. 17 bags 190 lbs. per acre of maize.
As for Fig. I., but the cowpeas were planted after the first cultivation of the maize when the maize was 12 to 14 inches high.

Fig. III. 20 bags 198½ lbs. per acre of maize.
Here the cowpeas were broadcasted between the rows of maize at the rate of 35 lbs. of seed per acre at the time of the last cultivation of the maize, 23 days after Fig. II. maize had been topped for silage.

the cowpeas were planted after the first and second cultivation of the maize respectively.

On plot No. 4 the cowpeas were broadcasted at the rate of 35 lbs. per acre between the rows of maize and the cultivator was then put through the crop for the third and last time. A Planet Junior horse hoe was the cultivator used and was found to cover the cowpea seed effectively.

The best growth of cowpeas was obtained from plot No. 4, and this method of planting the under-sown crop proved also to be a great saving in time and labour. As will be judged from the table of yields, the under-planted crop did not appear to have any detrimental influence on the growth of the main crop. The experiments are being continued on the same plots next season.

## UNDER-PLANTING OF MAIZE WITH COWPEAS.

| Plot. | Area. | Type of soil. | Previous 2 years' cropping. | Maize + 150 lbs. per acre bone and superphosphates. Date of planting | Date of under-planting cowpeas. | Yield per acre of maize. | Remarks. |
|---|---|---|---|---|---|---|---|
| C.P. 1 Fig. I. | ½ acre | Grey sand | 1926-27, tobacco with 200 lbs. double tobacco fertiliser per acre<br>1927-28, tobacco with 150 lbs. blood meal fertiliser per acre | 20/11/28 | 17/12/28 | 15 bags 47 lbs. | Cowpeas planted in same rows as maize, when maize was 4 to 6 inches high. Moderate growth of cowpeas. |
| C.P. 2 Fig. II. | ½ acre | Grey sand | Same as above | 20/11/28 | 26/12/28 | 17 bags 94 lbs. | Cowpeas planted after first cultivation of maize. Poor growth of cowpeas. |
| C.P. 3 | ½ acre | Grey sand | Same as above | 20/11/28 | 9/1/29 | 17 bags 190 lbs. | Cowpeas planted after second cultivation of maize. |
| C.P. 4 Fig. III. | ½ acre | Grey sand | Same as above | 20/11/28 | 17/1/29 | 20 bags 198½ lbs. | Cowpeas planted after third and last cultivation of maize. Broadcast between rows of maize. Best growth of cowpeas. |

**Experiment No. 2: Scrap Tobacco as a Fertiliser for Maize.**

Most tobacco growers accumulate each year scrap tobacco which is quite unsaleable, and experiments were carried out last season to ascertain the value of this waste product as a fertiliser for maize. The great danger to the tobacco grower in using unburnt tobacco scrap on the land is the fear of spreading bacterial disease in subsequent tobacco crops. It was therefore considered safest to burn the scrap and apply the ash on the land. Tests showed that the loss in weight of scrap tobacco on being burnt was approximately 90 per cent. Analysis of the ash showed its value to be about 4-5ths that of sulphate of potash, or £12 per ton, based on the price of that commodity in Salisbury at the time the analysis was made.

From these results it would appear that a planter would have to burn some 100 bales of scrap (each weighing 200 lbs.) to obtain about a ton of this fertiliser.

Three 1-6th acre plots were devoted to the test:—

Plot A received 600 lbs. of tobacco ash per acre.
Plot B received none.
Plot C received 800 lbs. of tobacco ash per acre.

The maize was planted by hand in check rows, the tobacco ash having previously been placed in each hill and well mixed with the soil. The crop was grown on very light sandy soil, the land having carried two previous tobacco crops which had received the usual fertiliser treatment.

## TESTS WITH SCRAP TOBACCO ASH AS A FERTILISER FOR MAIZE.

Time of planting maize: 20th November, 1928.

Variety of maize: Salisbury White.

Previous treatment of plots: 1926-27, tobacco with 200 lbs double tobacco fertiliser per acre; 1927-28, tobacco with 150 lbs. blood meal tobacco fertiliser per acre.

Date of thinning maize plants: 1st January, 1929.

Number of times cultivated: Three times by machine cultivator.

| Plot. | Fertiliser treatment. | Yield per acre. |
|---|---|---|
| A | 600 lbs. tobacco ash per acre | 15.07 bags. |
| B | No tobacco ash | 15.51 „ |
| C | 800 lbs. tobacco ash per acre | 15.21 „ |

## Experiment No. 3: Maize after Tobacco with no Additional Fertiliser.

*Test No.* 1.—These tests were carried out on poor, grey, sandy soil. The field had previously carried two tobacco crops, the first one, 1926-27, being fertilised with 200 lbs. of double tobacco fertiliser per acre, the second one, 1927-28, being fertilised with 150 lbs. of blood meal tobacco fertiliser per acre.

The ground was ploughed twice, once in July and cross-ploughed the second time in September, a final harrowing being given in November. The maize was planted by hand on the 22nd November, in check rows 3 feet by 3 feet apart, and four seeds to a hill. The plants were subsequently thinned to two plants to a hill on 24th December.

The land was cross-cultivated three times by machine, but no hand cultivation was done, the check rowing allowing of the land being kept free from weeds by means of the cultivators alone.

This plot, 2½ acres in extent, yielded:—

Good saleable maize ... ... ... 40 bags 37½ lbs.
Chaff and light grain ... ... ... ... ... 293¾ lbs.
Seed grain ... ... ... ... ... ... ... ... ... 78 lbs.

*Test No.* 2.—In this test the maize was grown on red, sandy, contact soil following two years of tobacco which had been treated in the same manner as in test No. 1.

The plot in this trial was 2¾ acres in extent, and in all cultural respects the methods employed were the same as in test No. 1.

The yield of Salisbury White maize from this plot of 2¾ acres in extent was:—

Good saleable maize ... ... ... 42 bags 146½ lbs.
Chaff and light grain ... ... ... ... ... ... 215½ lbs.
Seed ... ... ... ... ... ... ... ... ... ... ... 127½ lbs.

## Experiment No. 4: Maize after Tobacco on Unploughed Land as against Ploughed Land.

Farmers having reported good results from maize planted on the ridges after tobacco, without first ploughing the land, a trial to observe the results of this method of handling the crop was made.

A field with various types of soil was selected in order that the respective yield might be recorded from each. Except where one plot was ploughed to serve as a control, the following methods of planting and cultivation were carried out:—

The ridges on the land from the previous year's tobacco crop remained as they were, the dead tobacco plants being pulled out by their roots with the help of a hoe at the beginning of September. This left small depressions on the ridge where the tobacco plant had been. When suitable planting rains had fallen, i.e., by 26th November, four maize seeds were planted by hand in each depression, the crop thereby being automatically check-planted 3 feet by 3 feet, similar to the previous tobacco crop. The concentrated residue of the tobacco fertiliser helped the maize to get away early. Cultivators were kept going as soon as the crop was established, and in all it was cultivated six times, this being found necessary in order to keep down the weeds. The maize was thinned down to two plants per hill on the 26th December.

The results were as shown below, and favour the usual course of ploughing the land before planting. Had the rainfall been less generous during the early part of the season it is probable that the difference in favour of the ploughed plot would have been even greater.

## MAIZE AFTER TOBACCO ON UNPLOUGHED LAND.

Area of plots: ½ acre. Date of planting maize: 26th of November, 1928.

Number of cultivations: Six.

| Plot No. | Type of soil. | Previous year's crop. | Ploughed or unploughed. | Yield per acre. | Remarks. |
|---|---|---|---|---|---|
| 112 | Red, sandy, contact soil | Tobacco, with 125 lbs. per acre blood meal tobacco fertiliser | Ploughed | 21 bags 58½ lbs. | Soil uniform with plot 111 |
| 111 | do. | Tobacco, with 125 lbs. double tobacco fertiliser per acre | Unploughed | 17 bags 14 lbs. | Soil uniform with plot 112 |
| 110 | Pink, sandy soil, lighter than 111 and 112 | Tobacco, with 125 lbs. complete tobacco fertiliser | do. | 18 bags 44 lbs. | |
| 109 | Well bodied grey sand | Tobacco, without fertiliser | do. | 14 bags 107 lbs. | |
| 108 | Grey sand, lighter than 109 | Tobacco, with 125 lbs. per acre complete tobacco fertiliser | do. | 16 bags 57 lbs. | |

### Experiment No. 5: Maize on Virgin Soil.

In this test the new field had been stumped and broken up at the end of March, 1928. It received another ploughing in October and a final cross-ploughing and harrowing in November.

*Plot S.A.* 1 consisted of a very poor, shallow sand, containing a great deal of rubble and stone.

*Plot S.A.* 4 consisted of poor, grey, sandy soil, containing no stones or rubble

*Plot S.B.* 1 was a typical red, sandy tobacco soil, well drained.

*Plot S.B.* 4 was similar to plot S.B. 1.

All maize was planted by hand in check rows 3 feet by 3 feet, four seeds to a hill, the two strongest plants being left after thinning.

The results were as shown in the following table:—

## MAIZE ON VIRGIN SOIL.

| Plot No. | Fertiliser treatment. | Date maize was planted. | No. of times cultivated. | Yield per acre. | Remarks. |
|---|---|---|---|---|---|
| S A. 1 | Bone and superphosphate, 150 lbs. per acre. | 10/12/28 | Three | 5 bags 182½ lbs. | Soil contained a lot of rubble and stones. Maize under-planted with cowpeas on 12th February, 1929 |
| S.A. 4 | Do. | 10/12/28 | Three | 8 bags 12 lbs. | Maize under-planted with cowpeas on 12th February, 1929 |
| S.B. 1 | Do. | 5/12/28 | Six | 15 bags 41½ lbs. | Red sandy soil. Maize under-planted with majordas—these were a failure |
| S.B. 4 | Do. | 5/12/28 | Three | 12 bags 17 lbs. | Red sandy soil. Maize under-planted with kaffir beans, 5th February, 1929 |

# Instructions for Taking Soil Samples.

Issued by the Division of Chemistry, Department of Agriculture, Southern Rhodesia.

**Value of Soil Analysis.**—It is the belief of many people that an analysis of a soil must be an infallible guide as to its manurial requirements. Actual field experiments, however, have shown that this is not the case, and though an analysis determines to what extent plant foods are present or deficient in the soil, it does not necessarily indicate that these plant food elements may be completely available to the plant. It is not sufficiently realised by many farmers that the amount of plant food elements contained in a soil is only one factor affecting plant growth, and that other factors, such as the quality of the seed, the supply of air, moisture and heat, the physical condition of the seed bed and general cultivation are all factors of as relatively great importance to the growth of the plant as the supply of plant foods. It is only when all these other factors are most favourable for its development that the plant can be expected to make the best use of the plant foods at its disposal. Even when plant food deficiencies have been determined by analysis it does not always follow that the making good of such deficiencies by fertilisation will result in the maximum possible yield per acre of any crop. In spite of this fact, soil analysis, providing sufficient details regarding the past history of the soil are available to the soil chemist, may enable him to give valuable suggestions regarding the most satisfactory manurial treatment to accord to it. Again, there seems to be fairly reliable evidence that in the case of tobacco there is some correlation between the texture of the soil and the type of leaf that may be expected, and therefore for this crop an analysis may be of particular value.

**Method of Sampling.**—It must be clearly understood that for a soil analysis to be of any value the sample submitted for the purpose should be as representative as possible of the area under consideration. A few handfuls scraped at random from the most convenient spot are not only useless for a fair test, but are liable to mislead the chemist when he gives fertiliser and cultural advice for the land of which they are intended to indicate the general character. A report given upon a soil sample taken in a haphazard fashion may be worse than useless.

A definite area, containing throughout soil of the same type, ought to be selected, and its boundaries mapped out by the eye. Samples should be taken in at least six different places as widely apart as can be conveniently arranged. When the area is very large, more samples may profitably be taken.

These samples are obtained as follows:—

1. Remove surface vegetation and litter.

2. Dig a hole about 9 inches square and about 18 inches in depth.

3. From one wall of this hole cut off a slice of soil about 3 inches thick and to a depth not greater than where the colour of the soil changes, placing the slice on a clean sack. (The colour change indicates the beginning of the sub-soil.) If no colour change is discernible, it is advisable to sample to a depth of about 8 inches.

4. Repeat this process at the other spots selected and place all the slices on the same sack.

5. Mix the various slices *thoroughly*, and send in, carriage paid, to the Chemical Division, Department of Agriculture, Salisbury, about 5 to 6 lbs. of the mixture, carefully secured in a tin or bag and clearly labelled with a distinctive number.

   N.B.—*One* mixed sample, taken as above, is sufficient for every stretch of land *of the same type.*

Along with the labelled samples, information as under must be sent regarding each one:—

(a) Name of farm from which sample comes.

(b) Depth from the surface to which sample was taken.

(c) Number of years the soil has been under cultivation, with the crops grown on it, and, if possible, the approximate yields each year.

(d) The previous manurial and fertiliser treatment which the soil has had.

(e) Whether the soil is well drained, naturally or artificially, and whether it is particularly subject to erosion.

(f) What supplies of kraal manure are available.

(g) What crop it is desired to grow on the soil.

# Account Sales of a Shipment of 206 Bags of Ground Nuts (in shell), per s.s. Durham Castle

(MAY, 1929).

| | | |
|---|---|---|
| 70 bags ground nuts (red shell) at 26s. per cwt. | | £79 12 6 |
| 136 bags ground nuts (white shell) at 27s. 6d. per cwt. ... ... ... ... ... ... ... ... ... ... ... ... ... ... | | 163 12 6 |
| | | £243 5 0 |
| Less London Charges— | | |
| Freight at 86s. 9d. per ton ... | £39 1 10 | |
| Interest on freight ... ... ... | 0 1 0 | |
| Insurance ... ... ... ... ... ... ... | 0 15 4 | |
| 2½ per cent. agent's commission ... ... ... ... ... ... ... | 6 1 8 | |
| | | 45 19 10 |
| | | £197 5 2 |
| Less Beira charges ... ... ... ... | £4 10 8 | |
| Railage to Beira ... ... ... | 7 10 7 | |
| | | 12 1 3 |
| | | £185 3 11 |
| Less 5 per cent. commission ... ... ... ... | | 9 5 3 |
| | | £175 18 8 |

Net proceeds equals 17s. 0.97d. per bag of 98 lbs.

Net proceeds equals 13s. 7d. per bag of 78 lbs.

# Southern Rhodesia Veterinary Report.

## July, 1929.

### AFRICAN COAST FEVER.

Charter District.—The mortality on the infected farm Victor was twelve.

Mazoe District.—Mari Plumbi. There were five cases on this farm. It was decided to slaughter the remainder of the herd and eighty-two head were disposed of by the end of the month.

### TUBERCULOSIS.

One heifer on importation re-acted to the tuberculin test and was destroyed.

### CUTANEOUS MYIASIS (SCREW WORM) IN CATTLE.

A few cases have been reported.

### QUARTER-EVIL.

Fewer deaths have been recorded from this disease during this month.

### DISTOMIASIS (FLUKE).

Mortality amongst cattle was reported on three farms, and fluke was diagnosed as the cause, with the following mortality:—Mazoe, 10; Melsetter, 5; Umtali, 3.

### TRYPANOSOMIASIS.

Seven cases recorded in the Melsetter district, and several in the Darwin district.

### SCAB.

Two farms placed under licence in Melsetter district.

## DIPLODIA POISONING.

Several cases have been reported of animals sick and dying, and upon investigation this has been attributed to cattle grazing on old mealie lands.

## IMPORTATIONS.

From the Union of South Africa: Bulls, 28; cows, 241; heifers, 21; calves, 74; horses, 41; mule, 1; donkeys, 19; sheep, 1,794; goats, 518; pigs, 9.

## EXPORTATIONS (CATTLE).

To the Union of South Africa: For local consumption, 799; for overseas, 6,417. To Belgian Congo: Slaughter, 1,417; breeding, 85. To Northern Rhodesia: Breeding, 14.

## EXPORTATIONS (MISCELLANEOUS).

Union of South Africa: Pigs, 91. Northern Rhodesia: Sheep, 179; goats, 36. Belgian Congo: Pigs, 233; sheep, 49. Portuguese East Africa: Sheep, 60.

## COLD STORAGE EXPORTS TO THE CONGO.

Beef: Carcases, 334½; livers, 342; tails, 215; hearts, 301; tongues, 229; brains, 125; cheeks, 219. Calves: Carcases, 49; tongues, 45; hearts, 5. Sheep: Carcases, 74; tongues, 45; brains, 105.

N. L. KAYE-EDDIE,

For Acting Chief Veterinary Surgeon.

# Southern Rhodesia Weather Bureau.

## AUGUST, 1929.

**Pressure.**—During the month the mean barometric pressure was uniformly high, varying from 0.024 in. above normal at Salisbury to 0.014 in. above normal at Fort Victoria.

**Temperature.**—The temperature for August was generally low. The mean temperature varied from 4.4° F. below normal at Gwelo to 0.6° F. below normal at Essexvale.

The mean maximum temperatures were below normal, varying from 6.3° F. below normal at Hartley to 1.4° F. below normal at Essexvale.

The mean minimum temperatures varied from 1.7° F. above normal at Holly's Hope to 6.5° F. below normal at Sinoia.

Relative humidity was generally about normal.

**Rainfall.**—The following schedule shows the rainfall recorded during the month:—

ZONE A:—

| | |
|---|---|
| **Bubi—** | |
| Inyati | .12 |
| Shangani Estate | .12 |
| **Bulalima-Mangwe—** | |
| River Bank | .01 |
| **Gwelo—** | |
| Gwelo Gaol | .01 |
| **Umzingwane—** | |
| Springs | .01 |

| | |
|---|---|
| **ZONE B:—** | |
| Belingwe— | |
| Bickwell | .26 |
| Bulalima-Mangwe— | |
| Garth | .05 |
| Semokwe Reserve | .03 |
| Gwanda— | |
| Gwanda Gaol | .04 |
| Insiza— | |
| Albany | .07 |
| Filabusi | .11 |
| Inyezi | .22 |
| Scaleby | .13 |
| Wanezi Mission | .22 |
| Matobo— | |
| Fort Usher | .04 |
| Holly's Hope | .01 |
| Matopo Mission | .11 |
| Mtshabezi Mission | .03 |
| Rhodes Matopo Park | .03 |
| **ZONE C:—** | |
| Charter— | |
| Enkeldoorn | .16 |
| Marshbrook | .17 |
| The Range | .22 |
| Vrede | .15 |
| Gwelo— | |
| Delano Estate | .06 |
| East Clare Ranch | .10 |
| Globe & Phœnix Mine | .09 |
| Wold Farm | .11 |
| Hartley— | |
| Cromdale | .04 |
| Currandooley | .04 |
| Elvington | .04 |
| Hartley Gaol | .15 |
| Ranwick | .06 |

| | |
|---|---|
| **Lomagundi—** | |
| Between Rivers ... ... ... ... ... ... | .45 |
| Citrus Estate ... ... ... ... ... ... ... | .12 |
| Strathdon ... ... ... ... ... ... ... ... | .02 |
| Darwendale ... ... ... ... ... ... ... ... | .02 |
| Miami ... ... ... ... ... ... ... ... ... | .16 |
| Mica Field ... ... ... ... ... ... ... ... | .15 |
| Nyapi ... ... ... ... ... ... ... ... ... | .22 |
| Wari ... ... ... ... ... ... ... ... ... | .06 |
| Renardia ... ... ... ... ... ... ... ... | .10 |
| Sinoia ... ... ... ... ... ... ... ... ... | .07 |
| Woodleigh ... ... ... ... ... ... ... ... | .03 |
| **Salisbury—** | |
| Gwebi ... ... ... ... ... ... ... ... ... | .21 |
| Sebastopol ... ... ... ... ... ... ... ... | .07 |
| **ZONE D:—** | |
| **Inyanga—** | |
| Juliasdale ... ... ... ... ... ... ... ... | .64 |
| Rhodes Estate ... ... ... ... ... ... ... | .36 |
| **Makoni—** | |
| Ardlamont ... ... ... ... ... ... ... ... | .15 |
| **Mazoe—** | |
| Argyle Park ... ... ... ... ... ... ... | .09 |
| Bellevue ... ... ... ... ... ... ... ... | .28 |
| Bindura ... ... ... ... ... ... ... ... | .21 |
| Ceres ... ... ... ... ... ... ... ... ... | .26 |
| Citrus Estate ... ... ... ... ... ... ... | .51 |
| Craigengower ... ... ... ... ... ... ... | .19 |
| Glen Divis ... ... ... ... ... ... ... ... | .44 |
| Glen Grey ... ... ... ... ... ... ... ... | .34 |
| Great B. ... ... ... ... ... ... ... ... | .19 |
| Kingston ... ... ... ... ... ... ... ... | .44 |
| M'gutu ... ... ... ... ... ... ... ... ... | .11 |
| Shamva Mine ... ... ... ... ... ... ... | .59 |
| Stanley Kop ... ... ... ... ... ... ... | .25 |
| Virginia ... ... ... ... ... ... ... ... | .30 |
| **Mrewa—** | |
| Montclair ... ... ... ... ... ... ... ... | .04 |
| Nyaderi Mission ... ... ... ... ... ... | .26 |

| | |
|---|---|
| Mtoko— | |
| Mtoko N.C. | .25 |
| Salisbury— | |
| Meadows | .02 |
| Vainona | .02 |
| ZONE E:— | |
| Belingwe— | |
| Belingwe N.C. | .15 |
| Bikita— | |
| Angus Ranch | .01 |
| Chibi— | |
| Chibi | .17 |
| Lundi | .37 |
| Chilimanzi— | |
| Allanberry | .18 |
| Driefontein | .14 |
| Induna Farm | .03 |
| Mtao Forest | .08 |
| Mukowries | .08 |
| Thornhill | .06 |
| Gutu— | |
| Eastdale Estates | .12 |
| Gwelo— | |
| Partridge Farm | .02 |
| Inyanga— | |
| St. Trias' Hill | .36 |
| Insiza— | |
| Stoneham (Brac Valley) | .12 |
| Makoni— | |
| Forest Hill | .31 |
| Mona | .08 |
| Monte Cassino | 1.02 |
| Springs | .13 |
| Whitgift | .08 |
| Marandellas— | |
| Bonongwe | .30 |
| Delta | .09 |
| Lushington | .21 |
| Wenimbi | 1.15 |

| | |
|---|---|
| Melsetter— | |
| New Year's Gift ... ... ... ... ... ... | .04 |
| Selukwe— | |
| Aberfoyle Ranch ... ... ... ... ... ... | .07 |
| Safago ... ... ... ... ... ... ... ... ... | .10 |
| Umtali— | |
| Argyle ... ... ... ... ... ... ... ... ... | .04 |
| Embeza ... ... ... ... ... ... ... ... ... | .71 |
| Fern Valley ... ... ... ... ... ... ... | .22 |
| Odzani Power Station ... ... ... ... ... | .33 |
| Premier Estate ... ... ... ... ... ... | .08 |
| Sarum ... ... ... ... ... ... ... ... ... | .10 |
| Sheba ... ... ... ... ... ... ... ... ... | 1.62 |
| St. Augustine's Mission ... ... ... ... | .35 |
| Umtali Gaol ... ... ... ... ... ... ... ... | .36 |
| Victoria— | |
| Cambria ... ... ... ... ... ... ... ... | .12 |
| Cheveden ... ... ... ... ... ... ... ... | .35 |
| Clipsham ... ... ... ... ... ... ... ... | .10 |
| Silver Oaks ... ... ... ... ... ... ... ... | .15 |

ZONE F:—

| | |
|---|---|
| Melsetter— | |
| Chikore ... ... ... ... ... ... ... ... ... | .35 |
| Lettie Swan ... ... ... ... ... ... ... | .66 |
| Melsetter ... ... ... ... ... ... ... ... | 1.03 |
| Mount Selinda ... ... ... ... ... ... ... | .43 |
| Vermont ... ... ... ... ... ... ... ... | .72 |
| Umtali— | |
| Cloudlands ... ... ... ... ... ... ... ... | .95 |

## Dates of Meetings of Farmers' Associations, Southern Rhodesia.

| Name of Association. | Place of Meeting. | Secretary. | Oct. | Nov. |
|---|---|---|---|---|
| | | | 1929 | 1929 |
| Ayrshire—Sipolilo | Various farms | G. H. Cautherley | 12 | 9 |
| Banket Junction | Banket Hotel | A. M. Hutchinson | 4 | 1 |
| Beatrice District | Farmers' Hall, Beatrice | W. Krienke | 31 | 28 |
| Bindura | Bindura Farmers' Hall | W. E. Fricker | 11 | 8 |
| Bromley | Farmers' Hall, Bromley Siding | E. Taylor | 2 | 6 |
| Bubi | Queen's Mine | C. H. Olsen | 8 | 12 |
| Bulawayo Landowners' and Farmers' Association | Library Buildings, Bulawayo | T. B. Hepburn | 10 | 14 |
| Chakari | Various farms | Lady Codrington | 16 | 20 |
| Daisyfield | Daisyfield (Oct.), Somabula (Nov.) | L. E. Edwards | 19 | 9 |
| Darwendale—Trelawney | Various farms | Charles H. Tanner | 23 | 27 |
| Eastern Districts | Farmers' Hall, Chidza | W. E. Richards | 12 | 9 |
| Enkeldoorn | Enkeldoorn | C. N. Ludlowe | 1 | 5 |
| Enterprise | Farmers' Hall | W. Stobart | 1 | 5 |
| Essexvale | Essexvale | Col. D. Judson | 20 | 17 |
| Felixburg—Gutu | Various Farms | A. J. Bradshaw | 12 | 9 |
| Figtree Branch, R.L. and F.A. | Figtree Hotel | The Secretary | 1 | 5 |
| Gadzema | Gadzema Hotel | H. G. M. Liddell | 11 | 8 |
| Gatooma | Speck's Hotel | Col. J. A. Smith | 19 | 16 |
| Gatooma (Golden Valley Branch) | Golden Valley Hotel | C. K. James | 12 | 9 |
| Gazaland (South Melsetter) | Farmers' Hall, Chipinga | J. Ward | 19 | 16 |
| Greystone | Quarrie Farm | P. J. van der Walt | ... | 9 |
| Gwanda | Lowenthal's Building, Gwanda | N. J. B. Nilson | 19 | 16 |
| Hartley | Hartley Hotel | Mrs. F C. Watson | 12 | 9 |
| Headlands | Headlands | J. A. Eve | ... | ... |
| Hunter's Road | Hunter's Road | R. W. Twilley | 26 | 30 |
| Insiza South | Farm Lancaster | J. Campbell | 10 | ... |
| Inyazura | Inyazura | W. P. Frudd | 4 | ... |
| Lalapansi | Lalapansi | B. J. Ingle | 12 | 9 |
| Lomagundi | Sinoia | F. W. Robertson | 11 | ... |
| Lomagundi West | Various farms | A. A. Bisset | 13 | 10 |
| Macheke | Farmers' Hall, Macheke | R. O. Jackson | ... | ... |

| | | | | |
|---|---|---|---|---|
| Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association | Various Farms | T. R. Colam | 5 | 2 |
| Makwiro | Makwiro | W. L. Parsons | 18 | 15 |
| Marandellas | Marandellas Farmers' Hall | E. Cruikshank | 4 | 1 |
| Marandellas, Southern | Various farms | B. V. Cherry | 2 | 6 |
| Mashonaland | Mashonaland Farmers' Hall, Salisbury | C. Lamb | 11 | 8 |
| Matobo South | Farmers' Hall, Malundi Farm | A. G. Allan | 19 | 16 |
| Matopo Branch, R.L. and F.A. | Farmers' Hall, Malundi | W. Mirtle | 19 | 16 |
| Mazoe (Concession) | Various farms | Douglas Southey | 11 | 8 |
| Mazoe (Glendale) | Farmers' Hall, Glendale | James S. Brown | 9 | 13 |
| Melsetter | Court House, Melsetter | J. C. Kruger | 10 | 14 |
| Midlands Farmers and Stockowners | Royal Hotel, Gwelo | T. R. van Rooyen | 9 | 13 |
| Ngezi-Umniati | Harvieston, Enkeldoorn | Miss Harvie | 26 | 30 |
| North Umniati | ——— | J. F. Eagar | Not | received |
| Norton and Lydiate District | Norton | R. D. Palmer | 4 | 1 |
| Nyamandhlovu | Nyamandhlovu | R. D. McLean | ... | ... |
| Odzi District Farmers | Odzi Hotel | F. H. Burnett | 5 | 2 |
| Poorte Valley | Various places | A. D. Wilson | 19 | 16 |
| Que Que | Offices of the Que Que Sanitary Board | A. A. Ackerman | 19 | 16 |
| Rusape Farmers' Association | Rusape | R. Munch | 5 | 2 |
| Salisbury South | Various farms | P. Linton | 30 | 27 |
| Selukwe | The Hotel, Selukwe | W. T. Simpson | ... | ... |
| Shamva | Shamva Court House | W. Stanley-Stollard | 18 | 15 |
| Two Rivers Farming Association | Various farms | W. L. Parsons | 19 | 16 |
| Umboe (Branch of Lomagundi F.A.) | Various farms | C. W. S. Ford | 12 | 9 |
| Umvukwe Farmers' and Tobacco Growers' Association | Various ranches | Com. E. Wrightson | 12 | 9 |
| Umtali | Drill Hall, Umtali | A. Howat | 3 | 7 |
| Umvuma and District | Umvuma | S. T. Montgomery | Not | received |
| Victoria | Victoria | G. E. Lamb | 5 | 2 |
| Wankie District | ——— | F. H. Going | Not | received |
| West Umvukwe Farmers' Association | Various farms | G. H. Gordon | 5 | 2 |
| Western | Plumtree Hotel | The Secretary | 12 | 9 |
| Willoughbys | Willoughbys | A. E. Roberts | Not | received |

# Export of Cattle from Southern Rhodesia, 1929.

| Month | Union | | England. | Congo | | N. Rhodesia | Portuguese East Africa. | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Slaughter | | Slaughter | | | | | | | |
| | Johannesburg | I.C.S. for overseas | On hoof | Slaughter | Breeding | Breeding | Slaughter | Trek | Breeding | |
| January ... | 66 | ... | ... | 2,222 | 272 | 12 | ... | ... | ... | 2,572 |
| February ... | 84 | ... | ... | 656 | ... | ... | 12 | ... | ... | 752 |
| March ... | 12 | ... | ... | 1,845 | 1,803 | 19 | 24 | ... | ... | 5,056 |
| April ... | 242 | 1,842 | 75 | 2,933 | 1,131 | ... | 38 | ... | 22 | 6,283 |
| May ... | 224 | 4,318 | 620 | 1,508 | 2,966 | 17 | 24 | ... | ... | 9,677 |
| June ... | 538 | 6,322 | ... | 2,989 | 936 | 34 | 48 | ... | ... | 10,867 |
| July ... | 799 | 6,417 | ... | 1,417 | 85 | 14 | ... | ... | ... | 8,732 |
| August ... | 1,358 | 6,457 | ... | 2,530 | 684 | 21 | ... | ... | ... | 11,050 |
| September ... | | | | | | | | | | |
| October ... | | | | | | | | | | |
| November ... | | | | | | | | | | |
| December ... | | | | | | | | | | |

# Rhodesian Milk Records.

## *Official Milk Records.*

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| Ermine ... | Friesland | 1,429.60 | 35.31 | 52 | W. R. Blackwell, Norton |
| Nonaber ... | do | 1,012.80 | 33.12 | 40 | do do |
| Kleinhans ... | do | 1,456.30 | 40.04 | 46 | do do |
| Whinburn Daphne | do | 820.00 | 23.04 | 30 | R. R. Sharp, Redbank |
| Middleton's Zoe | do | 1,306.50 | 36.84 | 30 | do do |
| Whinburn Primrose | do | 1,894.00 | 78.30 | 60 | do do |
| Whinburn Spottie | do | 2,534.00 | 89.50 | 90 | do do |
| Middleton's Pamphylia | do | 2,698.50 | 78.19 | 90 | do do |
| Brightwell Rain | Red Poll | 977.20 | 33.61 | 30 | Government Farm, Matopos |
| De Grendel Selma | Friesland | 3,647.00 | 94.79 | 90 | Government Farm, Gwebi |
| Melrose Corrie... | do | 1,648.00 | 37.90 | 30 | do do |
| Gwebi Algie | do | 704.00 | 20.55 | 30 | do do |

## *Semi-official Milk Records.*

| | | | | | |
|---|---|---|---|---|---|
| Primrose ... | Grade Friesland | 466.40 | 16.04 | 18 | W. R. Blackwell, Norton |
| Waterbloem ... | do | 524.30 | 13.84 | 20 | do do |
| Kleinbloem ... | do | 284.00 | 8.66 | 9 | do do |
| Barbara I. ... | do | 1,249.30 | 31.85 | 30 | F. B. Morrisby, Gwelo |
| Freezia ... | do | 2,646.30 | 86.79 | 90 | do do |
| Youth ... | do | 1,569.60 | 48.01 | 60 | do do |
| Daffodil ... | do | 885.20 | 30.62 | 30 | do do |
| Whinburn Linnet | do | 2,811.50 | 73.32 | 60 | do do |
| Whinburn Buttercup | do | 2,262.00 | 71.08 | 60 | do do |
| Whinburn Butterfly | do | 1,758.00 | 50.00 | 60 | do do |
| Whinburn Sidi | do | 939.00 | 28.17 | 30 | do do |
| Whinburn Blackbird | do | 2,190.00 | 68.56 | 60 | do do |

## RHODESIAN MILK RECORDS (continued).

### *Unofficial Milk Records.*

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| Astralia ... | Friesland | 5,978.40 | ... | 268 | W. R. Blackwell, Norton |
| Ogden Hall Alberta | do | 8,654.70 | ... | 258 | do do |
| Dunoran Pearl | do | 9,078.80 | ... | 238 | do do |
| Edwinton I. ... | Grade Friesland | 741.70 | ... | 30 | Harley & Son, Syringa |
| Edwinton II. ... | do | 655.18 | ... | 30 | do do |
| De Grendel Froukje | Friesland | 4,616.50 | 119.81 | 120 | Government Farm, Gwebi |
| De Grendel de Hoop | do | 5,433.00 | 166.44 | 150 | do do |
| Melrose Hetta... | do | 10,244.50 | 343.07 | 210 | do do |
| Mimosa Stienser | do | 4,629.50 | 150.84 | 180 | do do |
| Mimosa Clara X. | do | 19,387.00 | 591.40 | 391 | do do |
| Mimosa Pel Wit Fancy | do | 4,370.00 | 130.59 | 120 | do do |
| Mimosa Pel Fancy II. | do | 5,788.00 | 198.57 | 150 | do do |
| Mimosa Clara II. | do | 4,024.00 | 126.94 | 120 | do do |
| Royal Tilford ... | do | 2,162.50 | 63.01 | 60 | do do |
| Gwebi Laura ... | do | 9,727.00 | 292.37 | 323 | do do |
| Gwebi Gay ... | Grade Friesland | 5,135.50 | 184.79 | 203 | do do |
| Gwebi Princess | do | 5,587.00 | 178.66 | 180 | do do |
| Kleinbloem ... | do | 5,418.50 | 171.01 | 150 | do do |
| Gwebi Kleinbloem | do | 4,920.00 | 147.12 | 150 | do do |
| Gwebi Waterbloem | do | 2,993.00 | 96.44 | 120 | do do |
| Waterbloem ... | do | 12,241.75 | 363.51 | 281 | do do |
| Gwebi Lucy ... | do | 5,270.00 | 153.84 | 150 | do do |
| Isa ... | do | 10,427.50 | 337.91 | 250 | do do |
| Clara ... | do | 7,339.00 | 276.68 | 175 | do do |
| Fanny ... | do | 8,190.00 | 280.15 | 180 | do do |
| Katie ... | do | 5,875.50 | 169.14 | 168 | do do |
| Lucy ... | do | 4,866.00 | 145.85 | 150 | do do |
| Gladys ... | do | 14,434.50 | 452.68 | 400 | do do |
| Hannah ... | do | 7,802.00 | 224.08 | 150 | do do |
| Black Bess ... | do | 2,216.00 | 92.68 | 90 | do do |

# Farming Calendar.

## October.

### BEE-KEEPING.

Bush bloom is now on, the queens consequently are laying vigorously, therefore give space and ventilation. In good districts, where stocks are strong, nectar may be coming in freely, and to prevent swarming it may be necessary to remove a crate of honey. By using the carbolic cloth, the operation is easily and quickly accomplished. At this season, whenever a crate of honey is removed, a properly fitted empty crate must take its place, otherwise the bees will swarm. Keep the apiary clear of weeds, and all hives well shaded. Feed any weak stocks.

### CITRUS FRUITS.

Citrus trees should not be permitted to suffer for want of water if a good setting of fruit is desired. Continue irrigation at fairly frequent intervals, especially if it is windy. Cultivation must follow each irrigation when the soil is fit to work, otherwise a large amount of moisture will be lost by evaporation. The packing of late fruit for export should be completed early in the month or before the rains commence. If rains intervene, the carrying properties will be affected and the fruit will probably break down in transit. Suppress all stem growths or water shoots as they appear. Young trees planted last season may with advantage have the stems whitewashed or washed with Bordeaux mixture paste; this will prevent undue sun-scalding of the unprotected stems. Plant cover crops with the first good rains.

### CROPS.

If not already attended to, overhaul all farming implements and replace worn parts to ensure efficiency. Shell ground nuts required for the season's planting. Ploughing of old lands should, at latest, be finished this month. If seed potatoes will not keep in good condition until next month, they may be planted now, but later planting is better. Edible canna may be planted this month before rain falls. Also velvet beans, dolichos beans and sunn hemp towards the end of the month for green manuring. Harvest winter cereals and plough under the stubbles as soon as possible after harvest. When rains have fallen, use every effort to improve the tilth of the lands which will be the first to be planted. On cloddy lands already ploughed, seize the opportunity to break down the clods by disc and drag harrowing as showers of rain fall. A spiked roller is very useful for this work. A good tilth means good planting, and a good stand of maize; therefore, do everything possible by cross ploughing, disc and drag harrowing to bring the soil into good condition for seeding.

When necessary, keep the harrows going to check early weed growth. Clean lands at this time of year are an insurance against cutworm and other insect pests. If weather conditions permit, plant a trap crop of maize to attract the stalk borer. New land to be ploughed and intended for planting this season should be cleared of heavy grass or weeds by burning or cutting to ensure good work being done by the ploughs.

Seasonal showers of rain are liable to spoil bricks unburned. See that bricks which have been made are protected from rain. Clean out guttering and down-spouts of house and farm buildings. Press on with development work so as to have this completed before rains break.

## DAIRYING.

During the month of October and until such time as the rains have commenced and green grazing is available, dairy stock require to be almost entirely stall fed. Cows in milk and cows due to calve should be liberally fed on succulents and concentrates in order that they may commence the dairying season in good condition, and make full use of the early grazing for milk production. Dairy cows that are underfed at this time of the year invariably produce milk of poor quality, and usually throw weedy undersized calves; furthermore, they do not pick up in condition until comparatively late in the season.

During October, the cow's ration should consist of succulents such as silage or green feed, etc., legume hay of good quality and a liberal allowance of concentrates; a pound or so of a feed such as ground-nut cake is invaluable for dairy stock at this time of the year.

Weather conditions are generally fairly warm during the month of October, and every precaution should be taken to keep the cream, which is used for butter-making or which is sent to the creamery, as cool as possible. The can or bucket containing the cream should be placed in a basin of water or concrete trough, in the dairy, and exposed to a draught; a piece of kaffir blanket, which dips into the water, should be wrapped around the can or bucket containing the cream. Churning of cream for butter-making is best carried out early in the morning—before sunrise if possible; the coolest water obtainable should be used for washing the butter whilst in the granular stage.

At this season of the year cheese-makers may find that the milk is deficient in butter fat; this is generally the result of under-feeding or unsuitable feeding. Cheese made from milk of low fat content is invariably dry and hard, defects that are accentuated by over cooking the curd or by cooking at too high a temperature. The curd should be firmed in the whey at a temperature not higher than 98° F. to 100° F.

## DECIDUOUS FRUITS.

Keep all trees well watered until the rains commence; cultivate after each watering to prevent evaporation of added moisture. Rub off all undesirable shoots, such as those arising on the main stem near the ground; also those shoots having a tendency to crowd each other. Two or more shoots should not be allowed to develop from the same spot on any part of the tree. Rub off the undesirable ones soon after they appear. The fruit of early peach trees should be thinned out if a heavy crop has set; this thinning will result in a crop of large-sized fruit. All fruit should be thinned out if necessary.

## ENTOMOLOGICAL.

Maize.—Where circumstances permit early growth of maize, crops planted late in October are liable to suffer in December from stalk-borer, especially if only a few acres are involved. If maize can be planted early in October, the plants are usually large enough by December to outgrow serious damage. Maize beetle is now in its pupal stage. Thorough working and smashing up of the soil at this time will destroy great numbers.

Tobacco.—See notes for last month, together with article in the "Rhodesia Agricultural Journal" for October, 1926, on "Baiting of Tobacco Seed Beds with Cyanogas Calcium Cyanide." The lands must be kept free from all weeds which caterpillars may feed on, and it is well not to have maize lands, tomato and Cape gooseberries near the lands; a clearing of some depth is advisable, which must be regularly weeded. If

poisoned bait is put down, it has been found that a covering of sacking or leaves will help to retain moisture and thus give further attraction, especially at this time of the year. In order to lessen the heavy infestation of caterpillars and other insect pests in the seed beds, coverings of hessian or cheese cloth should be kept over beds, especially at night; cutworm moths are nocturnal in habit, so that the coverings of the beds need to be moth-proof at night. Notwithstanding precautions in the covering of the beds, insects will enter, and after the emergence of the seedlings a weekly spraying should be carried out. Lead arsenate at the rate of 1½ ozs. (powder) or 3 ozs. (paste) in a 4-gallon petrol tin can be sprayed on the plants once a week to keep insect pests in check. Lead arsenate can be safely used with Bordeaux mixture, the mixture not reacting upon one another. The two combined sprays act as a preventative and deterrent to insect and fungoid troubles.

Cotton.—Thorough cultivation and keeping down of weeds should be resorted to in order to lessen the infestation of over-wintering pupæ, by exposure to the sun, and birds.

Potato.—Avoid introducing root gallworm and potato diseases to valuable land under irrigation or to the home garden with seed potatoes. Growing plants in October may be defoliated by caterpillars, or the tops severely injured by the potato tuber moth. Spray with arsenate of lead (powder), 1 lb. to 30 gallons of water; or (paste), 1 lb. to 16 gallons of water.

Cabbage, Turnip, etc., are apt to suffer severely from diamond back moth and webworm. Dust regularly with Paris green, 1 lb.; fresh water-slaked lime, 20 lbs. For cabbage aphis, water liberally, and wash plants regularly with a forceful stream of water from a hose or spray pump.

Beans and Peas are little attacked by insects at this time of year. If aphis (green fly) is troublesome, the plants may be sprayed with soap wash or tobacco wash. Leaf-eating beetles are best destroyed by hand.

Cucumbers, Marrows, etc., may be attacked by leaf-eating beetles, which quickly destroy the young plants. The young plants may be protected by gauze covers. Once vigorous growth has started, the damage is negligible.

Citrus.—All out-of-season fruit should be removed by this time. Destroy all fruit "struck" by the false codling moth. Aphis may be controlled by very careful spraying with the combined "Lime-Sulphur-Nicotine" spray (for details see "Rhodesia Agricultural Journal," Sept., 1926, page 871), while the yellow thrip may also be kept in check by this spray. Avoid using miscible oils for citrus spraying. A careful search should be made for the American bollworm ("Heliothis obsoleta"), and the Chief Entomologist should be immediately informed should this pest be found.

Deciduous Fruit Trees, including grape vines, are liable to attack by chafer beetles. Heavy spraying with lead arsenate (paste), 1 lb. to 10 gallons of water, or (powder), 1 lb. to 20 gallons, appears to afford considerable protection, but the leaves need thoroughly coating.

Fig.—Fruit infested with fig weevil should be collected regularly and destroyed.

## FLOWER GARDEN.

All flower seeds, annual and perennial, may be sown as in September. A word or two on open seed beds may not be out of place here. These beds should be prepared in a sheltered position, and the soil should be well and deeply dug. This is most essential, as in this state the soil when once watered is more easily kept moist, and is not so liable to cake. The top dressing should be free from all undecayed vegetable matter, and when sown, the seeds should be covered with a thin dressing of fine light soil, over which a thin covering of grass may be placed to check evaporation. Transplanting from boxes or beds should be done on a dull day or towards evening; the plants should be well watered before being

removed, and the roots disturbed as little as possible, care being taken that the latter have their full depth and spread when planting.

## VEGETABLE GARDEN.

As in September, nearly all vegetable seeds may be sown. Early potatoes should be earthed up when reaching the height of about eight inches. In planting a small amount of marrow, melon, cucumber, and pumpkin, the writer has found it economical to sow the seed one in a tin and transplant when about four inches high in hills. A few cucumbers planted in this manner yielded nearly 400 a week for about two months. Sweet corn and maize may also be sown this month.

## FORESTRY.

The main sowings of Eucalypt (gum) seed should be made either in seed trays or in well prepared seed beds. A well-broken soil forming a fine tilth in the seed bed ensures more successful germination and better plants. If transplants are being used, any seedlings which are ready should be pricked out.

Seedlings in open beds may have their tap roots cut so as to develop fibrous lateral roots, and thus produce good type stocky plants. Remember the plant feeds through its roots, hence the better the root system, the healthier the plant and the greater its chances of successful establishment. If conditions are favourable, cross-plough and harrow land for planting broken up in early autumn.

## POULTRY.

October is usually a hot month, and poultry keepers should therefore see that their birds have access to shade during the day. At the same time they should have plenty of air. One often sees birds during hot weather sitting under dense bushes, which is almost worse than no shade at all.

All houses should be examined and, if necessary, repaired. It is advisable to repeat the caution that birds must have dry quarters.

Many poultry keepers do not realise the vital necessity of giving their birds especially the young stock, plenty of succulent green food during the hot weather. It should be cut up and placed in boxes or hoppers about 7.30 a.m. and 5 p.m., and, if very hot, also at noon; it should never be placed in the sun. As much as the birds will eat should be supplied. Lack of it, especially during hot weather, causes a reduced output of eggs, smaller eggs and light-coloured yolks; further, a disease known as "nutritional disease" is likely to affect the birds and cause deaths. The symptoms are much like those of eye roup, without the well-known offensive smell of roup. It is due to the fact that vitamine A, which is present in large amounts in all succulent green foods, and which is so necessary for nutrition, is lacking. There is no doubt that many chickens and fowls die each year from this cause.

Ducks.—These during the hot weather require even more shade than do fowls; they cannot stand the direct rays of the sun nor sultry heat. The houses should always have dry floors, and should be overhauled before the rains commence. Ducks sleeping on damp floors often contract rheumatism and cramp. The floor of the duck house should be raised a few inches, thus ensuring a dry bed.

As many ducklings should be hatched as possible now, provided, of course, there is the prospect of a sale for them at ten weeks old. They thrive best in the wet weather.

Turkeys.—Stop hatching until after the wet season is over. To rear turkeys in the wet weather entails a good deal of time, labour, expense and often losses. Once a young turkey chick gets wet, it will probably die; at any rate it will never be the same bird it would have been had it not got wet. Give the older turkeys all the range possible; the further afield they go, the better grown birds they become, and less is the expense

of feeding. See also that their roosting quarters are water-tight before the rains commence.

## STOCK.

Cattle.—Ranching cattle on granite veld will in many instances be in fairly good condition on account of the early grass in the vleis, etc. On the diorite soils and later veld the cattle owner will still have to watch his weaker cattle carefully. In any case all supplies of hay, ensilage, majordas, etc., should be carefully husbanded in anticipation of possible late rains, but at the same time every effort should be made to prevent cattle becoming weak. Dairymen will need to feed highly both with succulents and green foods. Calves should be weaned and branded, if this has not already been done, and care should be taken that they do not suffer any serious set-back by reason of the want of veld. If calves are not desired in mid-winter, the bulls should be taken out of the herd now until the end of January. Care should be taken to provide a plentiful supply of clean water, and dipping must be regularly attended to.

Sheep.—If spring lambs are expected, one should see that the sheep shed is in order, and that there is a supply of hay, ensilage or mealies for the poorer ewes in the case of late rains. All drinking places should be cleaned out, and care taken that the water supply is sufficient.

## TOBACCO.

Continue to sow seed beds. Where grass has been put on the seed beds to assist germination of seed a daily inspection should be made, and as soon as the first few plants make their appearance the grass should be raised up a little from the bed in order to prevent the plants growing "spindley." All possible preparation for the coming planting season should be made.

## VETERINARY.

White scour is prevalent in spring—November and December—but dipping is eradicating this disease. There is still danger from vegetable poisoning, and it will only disappear when there is plenty of good grass on the veld.

## WEATHER.

This is apt to be a hot, dry month, and rather trying, therefore, to man and beast, and the strong winds which blow at this season add to the general discomfort. Evaporation is, as a consequence, at its greatest at this time of year, and dams and pools lose most from this cause. The prevalence of veld fires at this time of year adds to the anxiety of the stock owner.

The rainy season has occasionally started early in October, but for practical purposes it need not be expected before the end of this month. The days are becoming warmer, and often even hot and oppressive. Clouds gradually collect, at first disappearing at sunset, but later becoming more persistent. Sheet lightning is usually frequent, and showers of gradually increasing severity mark that the rainy season has set in. Steps should be taken in advance to provide for the run-off after such torrential rains, otherwise serious loss may result.

The normal rainfall varies from three-quarters of an inch to an inch in the different portions of the country. The rain usually occurs in the form of thunder-showers, which are not long sustained and are fairly local, but the total rainfall experienced during the month does not vary much over the whole country, with the exception of the eastern border, where the rainfall is usually heavier.

# November.

## BEE-KEEPING.

Now that the first honey flow is on, be sure the hives stand level, whether working them for extracted or section honey. This is important, saving annoyance when preparing the product for market. Occasionally, where bees have not been thoroughly subdued, they object to the removal of honey; postpone the operation for 24 hours. Where increase of stocks is required, artificial swarms can now be made. Use care in storing honey.

## CITRUS FRUITS.

If no appreciable rain has fallen, irrigation must be resorted to in order to keep the trees in good growth and to prevent any check to fruit development.

This is a good month to plant green crops. Sunn hemp is possibly the best crop to smother weed growth and supply humus-forming material after it is ploughed in.

If not already done, storm drains should be made on the sloping ground to prevent erosion of the surface soil during heavy storms.

Where new plantings are contemplated, the holes should be dug and everything got in readiness for planting if the trees are ready for lifting in the nurseries.

All unthrifty trees could with advantage have an additional amount of fertiliser and manure applied during the month. Keep down all water shoots.

## CROPS.

Take note when the first rains fall, and see what leaks there are, if any, in the farm buildings. Do not neglect to effect such repairs as are necessary. Early in the month see that the planters are in perfect order, and that they drop the different seeds to be planted evenly and at the right distance. Try them out on the farm road. Hasten the work of getting the lands for early sown crops into as good a condition for seeding as possible, so that the first and most favourable opportunity for planting may be seized. The young plants make more rapid growth in a good seed bed. Utilise exceptionally early rains for this purpose rather than for planting. The holes for check-row planting of maize can continue to be prepared until sufficient rain has fallen to allow of planting. Velvet beans and dolichos beans for seed or hay may be planted dry if the land is in good order. With favourable weather, planting of maize, velvet and dolichos beans and cotton will commence about the middle of the month, and will continue as the condition of the land and the rainfall permit. Main crop potatoes should be planted from now on to January. Dhal may be planted for seed or green manuring—if for seed, a frost free situation is necessary. Kaffir corn for seed may be planted this month. Green-manure crops requiring a long growing season should be planted. Destroy, by feeding or burning, early planted trap crop of maize or volunteer plants which have become infested with stalk-borer.

If weeds are beginning to show, keep the harrows going in front of the planters. If weeds are too advanced to be killed by drag harrows and too numerous to be dealt with by hand labour, use the disc harrow or lightly re-plough the land. If the tilth is good, do not be afraid to harrow the young maize. This will save much labour later on by destroying the weeds while they are small.

## DAIRYING.

In a normal year veld grazing should be plentiful in November, and the feeding of dairy stock is then very much simplified; veld grass in a green and succulent condition is practically all that is required for animals of less than average production. Heavy milking cows, however, on early pasture, require extra feed in the form of concentrates, while the latter should always be fed to dairy stock which are in poor condition at this time of the year. Young calves should not be turned out to graze with the herd, and in wet weather are best kept in a clean, dry, airy pen. Weaned stock, which have not hitherto had access to green pasture, should be gradually accustomed to the change in diet and may at first be turned out to graze for short periods. Young stock on pasture should also receive a small daily allowance of concentrates.

Farmers supplying cream to the creamery should adjust the cream screw to the separator so that the latter will separate a cream testing 45 to 50 per cent. butter fat. Cream of this consistency will keep better than thinner cream. It should be borne in mind that it is practically impossible to produce first-grade cream if the cattle are milked in a muddy kraal. In the absence of a cow shed, every endeavour should be made to erect a small milking shed in which four or five cows can be tied, milked and fed. A small shed of this kind is also essential to obtain clean milk for cheese-making. Milking in a muddy kraal invariably results in a gassy, bitter cheese being produced.

The shelves of the cheese room should be scrubbed with boiling water and soda, and for the last rinsing a weak solution of formalin may be used. This should prove effective in controlling cheese pests.

## DECIDUOUS FRUITS.

Continue thinning out fruit on the trees if a very heavy setting has occurred. A small amount of large-sized fruit is preferable to a large crop of small fruit. Thin down the inner growth of new shoots if they have a tendency to crowd each other, and stop all suckers and main stem growths as they appear.

## ENTOMOLOGICAL.

**Maize.**—Crops planted before the last week in this month are liable to suffer later from stalk borer. At Salisbury, crops planted after 27th November have escaped serious injury, but early December plantings are probably the safest. Volunteer maize is commonly badly infested and should be cut out and removed immediately, otherwise the borers tend to spread to surrounding plants. If rain has fallen sufficiently early, lands may be baited at the end of the month against surface beetles, snout beetles and other pests which tend to reduce the primary stand of plants. The formula is arsenite of soda 1 lb., cheapest sugar 8 lbs., or molasses 1 gallon, water 10 gallons. Dip chopped Napier fodder or other green stuff and distribute broadcast. The poison may be sprayed over volunteer maize and weeds on land with good effect. Cutworms do not usually appear in numbers until December, except in low-lying land. Succulent green stuff soaked in a 2 per cent. solution of sodium fluoride is the most recent formula for poisoned bait, but destruction of these pests is difficult. Keep the land clear of weeds as a preventive measure. If the young plants are attacked by the black maize beetle (heteronychus), the only remedy is to destroy by hand. Good, clean farming will control these pests to a large extent.

**Tobacco.**—This crop is subject to many pests in its early stages, although attacked by a few after vigorous growth has started. Keep cheese cloth covers on seed beds at night to exclude pests, and spray regularly with arsenate of lead (powder) 1 lb. in 30 gallons of water to protect against leaf-eating insects, etc. Lands may be baited against surface beetles with maize bran moistened with arsenate of soda 1 lb. in 30 gallons of water. Distribute in balls about the size of a golf

ball and cover over with branches or anything to protect from sun. Place one ball to each ten plants and moisten again when dry.

**Potato.**—The first brood of leaf-eating ladybirds appear in November. Spray with arsenate of lead (powder) 1 lb. in 30 gallons of water. Spraying is also useful against the black blister beetles, which sometimes attack the crop on sandy soils. Keep the soil of irrigated crops well hilled and in friable condition as a precaution against tuber moth laying eggs on the tubers.

**Kitchen Garden.**—Plants of the cabbage family are liable to attack by diamond-back moth and other leaf-eating insects. When considered desirable, young plants may be dusted lightly with arsenate of lead (powder). Cabbage aphis may be kept in check by liberal watering and frequent washing with a forceful stream of water from a hose pipe or spray pump. Drenching the plants regularly with cold water is also held to be a good remedy for the diamond-back moth mentioned above.

**Deciduous Fruits.**—Young trees may need spraying with arsenate of lead (powder) 1 lb. in 20 gallons of water as a protection against chafer beetles, whose attack may check the growth very seriously. Choice varieties of early peaches may be netted to protect them from fruit-piercing moths.

**When in doubt as to the identity of any pest or the method of dealing with it, apply promptly to the Chief Entomologist, Salisbury, bringing or sending specimens of the insects concerned. Note, however, that it is sometimes feasible to prevent injury from pests for which no practical remedy is known. Farmers should therefore endeavour to obtain some knowledge of the pests of the crops they are growing through the articles published in this Journal.**

## FLOWER GARDEN.

All seeds may now be planted. Annuals for January flowering should be sown, amongst which the following will be found to do excellently in this country:—Balsam, Calliopsis, Centurias, Chrysanthemum, Dianthus, Escholtzia, Marigold, Mignonette, Gallardia, Phlox, Poppy, Nasturtium, Nigella, Verbena and Zinnia. These are all hardy, and may be sown in the open either in beds or in the position desired for flowering. Advantage should be taken of each shower of rain during this month to keep the soil well worked and loose.

## VEGETABLE GARDEN.

All vegetable seeds may be sown during this month. Tomatoes and early peas and beans should be staked. The soil should be kept loose and free from weeds, which now get troublesome. Sow pumpkin, mealies, peas and potatoes.

## FORESTRY.

Sowings of eucalypt (gum) seed should be made for late planting. If fresh seed of cedrela toona is available, sowings should be made. Keep the seed beds moist and free from weeds. The tap roots of early seedlings may be cut back in order to form hardy, stocky plants most suited for planting. Continue with pricking out if transplants are to be used.. Prepare all land to be planted by cross-ploughing and harrowing. A well prepared soil is a good fertiliser; it assists establishment and reduces failures

## POULTRY.

Some birds will now be commencing to moult. This will cause a decrease in the number of eggs laid. The poultry keeper, therefore, should see that his birds come through the moult as quickly as possible. Some birds will lay and moult simultaneously, but these are the strongest, most vigorous and the best layers; the majority do not. The process of moulting is a natural one, but it is a severe strain on the system. Fowls that are not too fat, and can stand extra feed at the commencement of the moult, come through it best. More green and animal food should be given, and the

utmost care taken that they are not exposed to cold or wet, otherwise they will not only take longer to moult, but go off in condition. A little linseed stewed, or linseed meal, or ground nut meal and milk should also be given. There will next month be a demand for table birds, and such as the poultry keeper intends to sell should be selected. In making this selection, it is no use choosing old or scraggy birds, for it is hopeless to attempt to fatten these, or make them good table birds. Do not coop them up till a fortnight or so before they are to be sold; give them free range and feed them well, with at least one feed of soft food mixed with milk once a day. Turkeys destined for the Christmas market should have free range, but also a feed of soft food once a day, and a good feed of mealies in the evening.

## STOCK.

Cattle.—Normally rains should have fallen and the veld should be plentiful now. Beyond careful dipping, ranchers should not have much worry. If the season is bad, the poorer cattle should be drafted out and given a little hay, ensilage or mealies daily. Dairymen will not require to feed much succulent food, and usually the more expensive protein foods may be considerably curtailed at this time, but good sweet hay and mealies will be found to be very beneficial to milch cows, even if the veld is very plentiful. Clean dry sleeping places for both cows and calves will pay handsomely for any extra trouble involved. Young calves do not need to walk far, and in wet weather are much best in a clean dry pen. Watch for ticks.

Sheep.—Keep the sheep on high dry land. Be careful to keep the ticks down. Be sure the kraal or sheep shed is dry and clean, and that there is shelter from the rain for young lambs.

## TOBACCO.

Continue to sow seed beds, watering, etc. When early beds become overgrown and hard, pull out, dig up and re-sow. Begin transplanting with the first good rains, and continue as fast as the rains and planters will allow, until the crop is set out.

Be careful to fill in the misses from previous transplanting before starting on new fields; use the stoutest and best plants for filling in, and try to get the tobacco from any one field to grow and come to maturity as near at the same time as possible. Discontinue filling in when the field has been planted for several weeks, and has made a good start to grow, as the later filled in plants will be choked out by the earlier ones, and will not come to maturity. Cultivate fields as soon as plants are established, to keep down weeds.

## VETERINARY.

Early heavy rains might bring on horse-sickness before its usual time, but as a rule it need not be feared till the first rains are over in December.

## WEATHER.

The rains should be commencing, if not already begun; occasionally they have delayed until December, and even later, before setting in properly. Between spells of wet weather lasting several days, fine dry periods occur, at first clear, but later cloudy and thundery, gradually gathering to burst in thunderstorms. The mornings are generally fine, and rain falls chiefly in the afternoon or evening. Heavy downpours are to be expected, and should be provided against beforehand by means of ditches and embankments, and by clearing water ways and furrows.

In a normal season the rainfall varies from two-and-a-half to three inches in Matabeleland, and from three-and-a-half to four inches in Mashonaland generally, with the exception of the eastern border, where it amounts to five inches.

Between the rain periods and prior to the commencement of the rains, severe heat is likely to be experienced.

# Notes from the "Gazette."

| *"Gazette" Date.* | *Items.* |
|---|---|
| | AFRICAN COAST FEVER. |
| 23.8.29. | Government Notice No. 412 of 1929 is cancelled, and the following are declared areas of infection and guard area in lieu thereof :— |
| | NATIVE DISTRICT OF MAZOE. |
| | (a) *Areas of Infection.* |
| | 1. The southern portion of the farm Richlands. |
| | 2. The farms Grey and Mari Plumbi (Nos. 40 and 41, Glendale). |
| | 3. The farms Verona, Sweet Valley, Limbeck (Nos. 39, 31, 26 and 38, Glendale), Glen Grey and Umzi, including Glendale station. |
| | (b) *Guard Area.* |
| | An area bounded by and including the Chiweshe Reserve, Makori, Dunmaglas, Ireniedale, Longcroft, Hillymead, farms Nos. 28 and 27, Glen Grey, Umzi, Sussex, farms Nos. 1 and 2, Laurencedale, Georgia, Bretton, Granite, farms Nos. 20 and 19, Roan Flats and Mazamba. (G.N. 486.) |
| 6.9.29. | Government Notice No. 276 of 1929 declaring an area of infection in the Gwanda native district is cancelled. (G.N. 520.) |
| | POUND. |
| 13.9.29. | A pound has been established in the Bikita Native Reserve as from 20th September. (G.N. 531.) |

# Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

## AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.
No. 684. Warning to Maize Growers : Maize for Export.
No. 685. Notes on Farm Practices at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Orrdinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.
No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.
No. 743. Sunn Hemp, by S. D. Timson, M.C., Dip.Agric.
No. 750. Cotton in Southern Rhodesia—Hints to Growers, by G. S. Cameron, Empire Cotton Growing Corporation.
No. 751. The Sweet Potato, by S. D. Timson, M.C., Dip.Agric. (Wye).
Botanical Specimens for Identification.
Maize Grading Regulations.
Accelerating the Sprouting of Potatoes.

## REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.
No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.
No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.
No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.

No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.
No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.
No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.
No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.
No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.
No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.
No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H G. Mundy, F.L.S.
No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.
No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.
No. 564. A Maize Rotation Experiment, by A. R. Morkel.
No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.
No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.
No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.
No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.
No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.
No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.
No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.
No. 745. Salisbury Agricultural Experiment Station Annual Report, 1927-28, by H. C. Arnold.

## TOBACCO.

No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.
No. 607. Tobacco Seed Beds, by D. D. Brown.
No. 615.. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.
No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.
No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.
No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.
No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.
No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).
No. 661. Flue-Curing Tobacco Barns, 12 ft. x 12 ft. x 16 ft., by B. G. Gundry.
No. 665. Tobacco Pests of Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.
No. 671. Wildfire and Angular Spot of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.
No. 676. Mosaic Disease of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.

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Maize grown at the Tobacco Experiment Station on red sandy contact soil after a previous year's tobacco crop fertilised with a complete tobacco fertiliser. The land was not ploughed, the maize being planted in the holes left after the tobacco plants had been pulled out. It was found necessary to put the cultivators through the field six times to keep down weeds.
This plot yielded over 18 bags of maize per acre.

THE RHODESIA

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## Editorial.

*Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.*

**Cotton.**—In the November issue of the *Agricultural Journal* one year ago there appeared an article on U. 4 cotton in which it was foreshadowed that there would be sufficient seed for general distribution this year. The hopes there expressed have been fully realised, and it is satisfactory to record that sufficient U. 4 cotton seed has been produced to meet all demands, and that there is the possibility of a small surplus at the end of the planting season. In this connection attention is drawn to the advertisement on another page of this issue.

**Milk Recording.**—Farmers who wish to secure the services of the official milk recorders—Messrs. Fitt and Trenor—should immediately notify these officers as soon as the first of the cows which they wish to record has calved. In order that the test should be recognised as official it is essential

that the test should be made within 30 days after the record has commenced. Information as to dates of calving and requests for visits should be made direct by Mashonaland farmers to Milk Recorder R. H. Fitt, P.O. Box 387, Salisbury, or in the case of Matabeleland farmers, to Milk Recorder T. J. Trenor, P.O. Box 566, Bulawayo.

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**Witch Weed.**—Effective methods of control of this very serious menace to the maize grower are discussed in an article in this issue of the Journal, and all farmers who grow maize are urged to read this with care and to take immediate steps this season to institute a definite defensive and destructive policy against the insidious spread of the parasite.

This threat to the safety of the maize farmer cannot be taken too seriously, but, thanks largely to the valuable research work of Mr. Saunders at Potchefstroom, we are in possession of proved means of controlling the spread of the pest and the damage done by it.

All growers of maize should take steps to make themselves familiar with the appearance of witch weed, and should make careful search for the parasite through their maize lands and the adjacent veld, and take drastic steps, if it is found, to eradicate it. The best policy to be instituted on any particular farm to control the parasite will vary with the severity of the attack and local conditions, and farmers are reminded that the services of officers of this Department are available if they wish advice or assistance in formulating an economical scheme of control on their farms.

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**Sheep Diseases in Southern Rhodesia.**—In this issue we publish an article on sheep diseases, by Mr. D. A. Lawrence, of the Veterinary Research Department. Readers are aware that the sheep industry is on the increase, and this article should be of great assistance in enabling the farmer to maintain the health of his flocks. Attention is also directed to the methods of recognising the various diseases. Thus one may put into immediate practice the curative and preventive measures described and minimise further losses.

Particularly is attention directed to the general methods of prevention of disease, as no doubt it is in the maintenance of good health that success must eventually depend.

In this connection readers will realise that it is not an economic proposition to wait for a disease to appear and then undertake treatment, as in dealing with many animals treatment of those already diseased will mean the expenditure of an unnecessarily large amount of time and money. With a valuable animal the adoption of curative treatment is worth while, whereas with large numbers of animals whose individual values are small the policy of waiting for the disease to appear and then to undertake treatment is unsound.

It is hoped that by following the advice given in this article the difficulties associated with sheep raising will be largely overcome.

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**Appointments of Assistant Poultry Experts.**—The poultry industry in Southern Rhodesia has so developed as to warrant the appointment of two additional poultry officers in the Poultry Branch of the Department of Agriculture.

Mr. F. Roberts, of Bloemfontein, and Mr. Guy H. Cooper, of Pietermaritzburg, have been appointed as Assistant Poultry Experts, and have assumed duty.

Mr. Roberts was a poultry student at the Potchefstroom School of Agriculture in 1911, and on the completion of his course he joined the staff of the Union Government Service and took charge of the Government Poultry Plant at Grootvlei, and afterwards went to Glen,. when the Agricultural College was opened there.

Mr. Cooper was a successful student at the Cedara School of Agriculture, Natal. On the completion of his course there in 1920 he was appointed Poultry Instructor at the "1820 Memorial Settlers' Association" farm at Mortimer, Cape Province. He has since developed the well known Stapleford Poultry Farm in Natal.

Both of these officers are practical poultry men and capable instructors. They will no doubt be of considerable assistance to poultry farmers in this Colony, especially as the industry gives promise of much expansion in the near future.

Mr. Roberts, Assistant Poultry Expert, has been transferred to Bulawayo as itinerant poultry officer in Matabeleland. It is hoped that poultry enthusiasts in that province will fully avail themselves of this opportunity for expert assistance and advice.

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**The Citrus Industry.**—Citrus fruit growers and others will be interested to read the report published in this issue of the Journal of the impressions gained by Mr. V. A. Putterill, Chief Fruit Inspector to the South African Union Government, during a recent visit to this Colony. It is pleasing to note that Mr. Putterill considers that our citrus industry is managed in a businesslike and efficient way and that the problems of growers are being squarely faced. Citrus growing is comparatively quite a young industry in Southern Rhodesia, and there is much to be learned about such matters as the best varieties to grow, irrigation required and soil treatment. Mr. Putterill's remarks about the Washington Navel confirm the experience of a number of growers, and there is undoubtedly need for investigation with a view to finding a good commercial mid-season variety.

The export of citrus fruits from this Colony in 1928 amounted to over 25 per cent. of the total quantity of citrus fruit shipped by growers from all the provinces of the South African Union. The total number of cases sent from Southern Rhodesia in that year was 176,817, and the Valencia Late crop, comprising approximately 116,000 boxes, now amounts to nearly two-thirds of the output in the south. It is expected that shipments from Southern Rhodesia this season will amount to close on 200,000 cases. The great bulk of our fruit is sent to the United Kingdom, where the public is beginning to relish oranges in the summer. Small regular shipments have also been made this season to the Sudan, India, Ceylon and Marseilles, where it is hoped to establish paying markets. A present handicap is the long railway haul entailed by exporting fruit via Capetown, and for this reason 30,487 cases were shipped via Beira with, we believe, successful results.

Citrus growers in Southern Rhodesia have adopted the principle of co-operation whole-heartedly, and the success attained is a striking example of the benefits of working together for the common good.

# Sheep Farming in the Midlands.

By J. Park Hamilton, M.R.C.V.S.,
District Veterinary Surgeon, Gwelo.

Sheep farming in the Midlands has received considerable attention during the past few years, particularly in the west Gwelo district round Somabula. Most of the farmers there have small flocks of Merino sheep, and one or two farmers have had sheep since about 1914. I have recently made an inspection of most of these farms with sheep, and by comparing the results obtained by the different farmers, some idea is got as to the position of the industry generally, and these results are of considerable value and well worth studying by all those who have sheep or who intend to go in for sheep.

The sheep industry may still be considered to be in the pioneer stage, and, like all pioneer industries, there have been unexpected difficulties—some of which have been successfully overcome and others which at present are hindering progress may eventually be surmounted. Credit must be given to those farmers who have done and are doing this pioneer work, and much may be learned from the failures as well as from the successes.

The losses sustained from different causes up to the present time about counterbalance the natural flock increase, so that the position to-day generally is not satisfactory. However, some of the reasons for these failures are known, and if the recommendations are adopted an improvement will result.

The question will arise: Are all the expense and care entailed in carrying out the foregoing recommendations going to be justified by results? This is a very important question and can only be answered by the farmer himself balancing the expenses against what he might hope to get from a

fairly successful flock. On the other hand, if sheep are not managed on the lines indicated, then failure and disappointment sooner or later will result.

One common experience in sheep farming is that a small flock of, say, about 50 sheep usually does all right under practically any conditions, and it is when farmers, encouraged by this success, branch out and increase their flocks that the difficulties and losses arise.

**Internal Parasites.**—The reason for the greater percentage of losses which occur in larger flocks is fairly obvious, and depends mostly to what extent the sheep are infested with the internal parasites, wire worm and also nodular worm.

All sheep in Rhodesia have these parasites to a certain extent, and the larger the flock is, the greater risk there is of the sheep becoming infested.

The wire worm parasites lay enormous quantities of eggs, which are passed out in the droppings of the sheep; and even an infected sheep which is still outwardly healthy may pass as many as three million per day, and under favourable conditions these eggs hatch out within 24 hours.

The immature worm or larva goes through varying stages of development from the time it hatches out on the ground and is picked up by the sheep. In the stomach of the sheep development into a mature worm occurs in about 14 days' time (Union of South Africa Government Pamphlet 40, 1922). With such a rapid development it is obvious the danger that sheep run of becoming badly infested.

An excellent description of the life cycle of the wire worm is given in the October issue of this Journal in "Notes from the Veterinary Laboratory," and I recommend the reader to study this.

Fortunately, wire worm can be controlled by regular dosing with Theiler's wire worm remedy, and many farmers have proved this to their own satisfaction, and at one time I thought that by doing this the greatest obstacle was overcome. Recently, however, in several regularly dosed flocks, serious losses have occurred, due to the parasite known as the nodular worm.

The nodular worm is usually found in the large intestine of the sheep, and in the immature stage burrows into the wall of the intestine, causing the formation of a small pimple like swelling.

In small numbers these parasites do not appear to cause much damage, but where numerous they cause a very serious mortality, sometimes 50 per cent. of the flock dying in a few weeks.

Unfortunately, up to the present time there is no certain remedy for this parasite. Among the most successful treatments are giving the sheep tobacco, salt and Kerol licks, and some success has been obtained with medicated bowel enemata. The fact remains, however, that the parasites are a serious menace, and the best means of control is to control infection by giving the sheep only well water and fencing off any surface water, as it is round surface water that the damp ground is most suitable for hatching out the eggs of these worms. Further, it is advisable to change grazing ground frequently by having a number of paddocks.

**Shedding.**—The question of shedding is also important, as sheds are undoubtedly a source of infection, and the best flocks I saw on my recent inspection were undoubtedly those which were not shedded at all. In those cases the farmers had a small wire-netted paddock with some trees for shelter in it, and the sheep came through the heavy rainy season in better condition than those shedded; in fact, among those sheep shedded there were quite a number of losses from pneumonia.

**Blue Tongue Inoculation.**—The inoculation against blue tongue has been generally adopted and proved its efficacy.

Last rainy season was a good test, with a 40-inch rainfall, and the sheep came through the season very well.

The time for inoculation is important, as it is essential that the sheep have recovered before heavy rains set in; it is also advisable to have good feed for the sheep during convalescence, so early in November appears to be the best time for inoculation; by then there should be a little green grass and the rains are not likely to be troublesome.

**Feeding.**—There is also the question of feeding. It is absolutely necessary to provide additional winter feeding and to keep the sheep in fair condition, and too little attention has been paid to this aspect in the past.

Winter crops of oat forage should be grown, and when necessary a small ration of crushed mealies should be given. This is most important in the case of pregnant ewes, as I find the main reason for poor lamb crops is the indifferent condition of the ewes, and in these cases many weakly lambs are born, and also ewes lamb down without sufficient milk. It is advisable to provide a salt lick for sheep, and in the case of ewes especially great benefit is derived in giving a medicated lick as follows:—

| | |
|---|---|
| Bone meal ... ... ... ... ... ... ... ... | 40 lbs. |
| Ground lime ... ... ... ... ... ... ... | 30 lbs. |
| Salt ... ... ... ... ... ... ... ... ... ... ... | 30 lbs. |
| Potassium iodide ... ... ... ... ... ... | 3 ozs. |

The iodide to be dissolved in a bottle of water and sprinkled over the salt and other ingredients.

Although the establishing of a sheep industry here seems to be beset with difficulties at present, at the same time it is encouraging to know that other countries, such as New Zealand and parts of the Union of South Africa, have also had great difficulties to overcome in establishing sheep, and to-day it is common knowledge how successfully this has been done.

# Witch Weed.

*STRIGA LUTEA.*

## METHODS OF CONTROL.

By S. D. Timson, M.C., Dip.Agric. (Wye).

Although much still remains to be done in connection with the investigation into the life history of witch weed and in discovering more efficient or economical methods of control, yet as a result of the very valuable research work carried out by Saunders at the Potchefstroom School of Agriculture, and in part due to recent field observations in this country, we are in a position to make preliminary recommendations with regard to the control of the pest.

The methods of combating the ill effects of the parasite on the maize crop may roughly be divided into—

*Direct Methods* by destruction of the weed.

*Indirect Methods* by assisting the maize plant to produce a crop of grain, despite the presence of witch weed.

### DIRECT METHODS.

**1.** (a) **Storm Water Drains.**—Under the heading of "direct methods" may be conveniently placed methods of prevention of re-infestation of maize lands. Witch weed is indigenous in the veld, and the seed is carried thence by storm water largely, though it is also carried by wind. Therefore deep open drains to cut off the storm water from infested veld lying above the maize lands should always be constructed, and they should be made to spill the water into a stream if possible or on to land where the witch weed seed can do no damage.

The construction of such drains should always accompany or precede any other measures designed to control or destroy the parasite.

(b) **Contour Ridging** will also assist considerably in the control of witch weed by tending to prevent the spread of the seed through the lands in storm water.

(c) **Burning Grass on Virgin Lands.**—Where virgin land which is known to be infested with witch weed is to be planted with maize it is good practice to burn the grass and rubbish on the land before ploughing. This will destroy much of the seed of witch weed lying on the surface which has not penetrated the soil through cracks.

Where the veld adjacent to the maize lands is badly infested with the parasite it may be advisable to burn this over during the dry season to assist in preventing the re-infestation of the maize lands.

**2. Destruction by Cultivation.**—When witch weed is present only in isolated patches in the maize lands it may be eradicated by persistent and careful machine and hand cultivation of the land. The cultivations must be done frequently and thoroughly enough to prevent a single witch weed plant from flowering and setting seed. This work requires constant supervision to be successful, and the labour must be taught to recognise the weed before it flowers. Half measures are useless, and as there is still doubt as to whether a plant which has been cut off in the flowering stage is able to ripen seed, it is necessary to collect all witch weed plants in flower and carry them off the land in stacks and destroy them by burning or burying deeply.

It should also be realised that all the witch weed seed in the soil is not germinated at one time, and so successive crops of the weed appear from about six weeks after germination of the maize crop onwards. Futher, some of the witch weed plants make secondary growth from the stems cut by shallow cultivation. Therefore there is a continuous succession of crops of witch weed growing up during the season, and to ensure that no plant is allowed to seed requires careful observation and frequent cultivation, and in some cases even weekly cultivation is necessary.

The ordinary straight points used on a cultivator are of little use against witch weed, and duck-foot type points

should always be used where the parasite is present, and the No. 46 Ransomes type of cultivator point is particularly useful. A point or design of cultivator which gives a horizontal cutting action below the soil surface is desirable.

Unfortunately, soon after the first witch weed appears above ground machine cultivation, as done on most farms in the country with a pair of oxen, must cease, owing to the damage done to the maize; but if the maize crop can be check-rowed and single mules, donkeys or oxen can be used for cultivation both ways, the amount of hand weeding necessary is greatly reduced, as machine cultivation can be prolonged to the end of the season.

Where the parasite is in isolated patches these can be destroyed by hand cultivation, but where it occurs fairly widespread throughout large acreages, destruction by hand hoeing becomes impracticable, and if a maize crop must be grown on the land, then, as far as the labour supply allows, check-rowing combined with frequent machine cultivation must be carried out. Even where the labour supply is small, considerable acreages can be hand planted in check rows if an early start is made before the rains arrive.

**3. Trap Cropping.**—Trap cropping implies the planting of a favourable host plant on land infested with witch weed in order to cause the germination of the parasite and then ploughing under the trap crop before any witch weed plant can flower and set seed. As witch weed appears above the ground about six weeks after germination, the trap crop must be ploughed under within about two months of its appearance above the ground.

Saunders, of Potchefstroom, states that trap cropping is the most promising method of control or eradication yet evolved, and he has found that a reduction in witch weed infestation of 98 per cent. has been brought about by trap cropping for two years. Three successive croppings with Sudan grass over a period of one and a half years has reduced witch weed infestation by 90 per cent., while trap cropping twice with Sudan grass in the same season should reduce the witch weed infestation by about 70 to 75 per cent. Since this method has been found so effective in eradicating witch weed from heavily infested lands, it only remains to design suitable ways of employing it and fitting them conveniently into the

general policy of working the farm. To assist the farmer to decide how he shall best adopt a system of trap cropping, the following methods are suggested.

*Trap Crop Recommended.*—The trap crop recommended is Sudan grass, sown at the rate of 20 lbs. of seed per acre. If Sudan grass is not available, then maize sown at a rate of 50 lbs. per acre may be used.

(a) *Trap Cropping with Three Successive Crops.*—Where a farmer has a considerable acreage on his farm so severely infested with witch weed that the yield of maize has fallen to an uneconomic point, it becomes necessary to deal with the pest drastically.

This may be done by broadcasting a trap crop of Sudan grass just before the rains in October or November. As soon as the first witch weed plant is seen in flower, or about eight to nine weeks after germination of the Sudan grass, the grass must be cut and the stubble ploughed under or the whole growth be ploughed under. A second crop of Sudan grass is immediately sown, and this in turn is ploughed under, or reaped for hay and the stubble ploughed under. In some seasons a third crop of Sudan grass may perhaps be sown in the latter half of February or early March, and this in turn be ploughed under or grazed off by stock until the witch weed flowers, and then ploughed in. If only two trap crops have been sown the previous year, then in the following season a trap crop of Sudan grass may again be ploughed under, and this followed immediately by ground nuts, sunflowers, cowpeas, beans or any other short season crop.

If three trappings have been effected in the one season, then it should be safe to plant maize.

If the acreage to be treated in this way is large, then the area may be reduced by planting immune cash crops such as sunflowers, ground nuts, bean crops for seed, Sunn hemp for seed—in fact, any crop which is not a grass crop—on a portion of the infested lands, and treating such land by trap cropping in the following year or years. After trap cropping the land in this way the subsequent maize crops planted must be kept free from the weed by thorough machine and hand cultivation, to ensure that not a single witch weed plant is allowed to set seed.

(b) In less severe cases it may be sufficient to grow two successive trap crops in the same season if the following maize crop is thoroughly cultivated to ensure the destruction of all witch weed plants before they can set seed.

(c) Where the farmer cannot afford to give up his land to trap cropping for a whole year, then he may follow one early trap crop planted dry by a cash maize or silage crop, spaced 4 feet by 2 feet, and carefully kept free from witch weed, or by sunflowers, ground nuts, kaffir beans or haricot beans to be reaped for seed.

(d) *Combined Trap Cropping and Green Manuring with a Legume.*—Green manuring may be conveniently combined with trap cropping. A trap crop of Sudan grass may be sown just before the rains and ploughed under two months after germination. Sunn hemp is then sown immediately at 40 lbs. of seed per acre, which is disc-harrowed in. The Sunn hemp is then ploughed under in the normal way in the late flowering stage.

The following variation of combining the two crops can be also introduced:—

Sunn hemp (20 lbs. per acre) may be mixed with the Sudan grass seed, when the second trap is sown, in the method (c) described above. This system should be fairly effective in eradicating witch weed, and the ploughing under of the legume should materially improve the soil.

Other variations of the combination are possible and will suggest themselves to the practical farmer.

*Depth of Ploughing.*—Where land is to be trap cropped for witch weed the first ploughing should be fairly shallow—not more than five or six inches deep—so that the witch weed seed is not deeply buried. On the other hand, where a commercial crop of maize has to be planted on witch weed infested land without previous trap cropping, the land should be as deeply ploughed as local conditions will allow, so as to bury the seed of the parasite deeply. Deep ploughing has been found to reduce the amount of witch weed appearing above ground, probably due to the fact that a portion of it is germinated late in the growing season and fails to reach the surface from the lower levels in the soil.

*Fertiliser for Trap Crop.*—The application of a quick acting phosphatic fertiliser, such as superphosphate, to the trap crop is good practice, as the root system of the trap crop is thereby stimulated, which should lead to the germination of a greater quantity of the parasite. Further, the crop will make more rapid growth during its limited growing season, and the fertiliser applied will, where the crop is ploughed under, be available for subsequent cash crops.

## INDIRECT METHODS
### of combating the effects of witch weed.

The farmer who is compelled by circumstances beyond his control to grow maize on land infested with witch weed must carefully scrutinise his methods of farming (and he may obtain the assistance of the officers of this Department in doing so) to see where he can improve them, so as to assist his maize in every way possible to produce a paying return, despite the attack of the parasite. Much can be done in this way to ensure a profitable return from his land.

Slovenly methods of farming, even under normal conditions, are to be condemned, but where the maize has to fight the attack of witch weed they may well prove fatal.

The writer does not propose to review here the whole field of operations necessary to produce the maximum yield of grain from the soil, but proposes to discuss certain phases of the maize producer's business which, in the light of Saunders' work at Potchefstroom and of field observation done in this country during the past year, appear to be likely to repay special attention.

**1. Rotation of Crops.**—Apart from the well-proved benefits to the soil and the crops grown thereon following the practice of rotation of crops, it is perhaps well to emphasise certain particular advantages which the maize farmer obtains from this practice, where he is compelled to combat the attacks of the parasite over a large acreage of his land.

By the introduction of other crops into the rotation which are immune to witch weed, such as ground nuts, sunflowers and bean crops, the area of land to be planted to maize is reduced, and in consequence there is a reduction in any one year of the extra expense in the way of additional

fertiliser, outlay on hand cultivation and machine cultivation, etc., necessary to combat the effects of witch weed.

Again, if a portion of the land can be planted to Sunn hemp the cost of working that portion is greatly reduced as compared with the cost of producing a crop of maize. Apart from the value of the seed, the cost of growing and ploughing under a crop of Sunn hemp should not exceed 10s. per acre, whereas the cost of producing a crop of maize is in the neighbourhood of £2 10s. to £3 10s. This will help the farmer to concentrate his energies on endeavouring to ensure a good yield of maize from the reduced area of his land under that crop.

Enough has been said to indicate the important part that a properly designed rotation of crops can play in assisting the farmer struggling with this problem.

**2. Depth of Ploughing.**—Certain experiments at Potchefstroom indicate, as has already been mentioned, that deep ploughing reduces the number of witch weed plants appearing above ground. This is probably due to the fact that by ploughing the soil deeply the seed of the parasite is buried deeply, and some of it is germinated by the roots of the host plant too late in the season to allow the witch weed plants to reach the surface. Conversely, where a trap crop is to be planted it would appear advisable to plough the land fairly shallowly so that the seed may remain within easy reach of the roots of the host plant.

A word of warning must be written concerning the dangers of ploughing too deeply. On land where the subsoil is very "raw" and harmful to crops, care must be taken not to lift too much of this each year, as the bad effects of turning up the sub-soil may on some soils equal the damage done by witch weed.

**3. Manuring and Fertiliser.**—Saunders has found that manure and fertilisers appear to have no retarding effect on the growth of witch weed, but enable the host crop to produce better seed than otherwise would be the case, despite the attack of the parasite.

As was to be expected, in the experiments inaugurated by this Department, with the assistance of farmers at Concession and Glendale, last year, there were clear indications

that a quick acting fertiliser, such as superphosphate, assisted maize attacked by witch weed to give a greater yield of grain than a slow acting fertiliser, such as rock phosphate.

Maize treated with superphosphate also gave a greater yield than maize untreated, and maize treated with rock phosphate gave a slightly better yield than maize untreated. Therefore the application of quick acting fertilisers suited to the local conditions is to be strongly recommended where maize is planted on witch weed infested land.

On farms where little or no kraal manure is made the practice of green manuring is highly advisable, as it maintains or increases the fertility of the soil, assists to free the land from weeds (if a smother crop such as Sunn hemp is used), improves the physical condition of the soil and, as has been mentioned already, it reduces the area of land under maize and so enables the farmer to concentrate his attack on the witch weed.

**4. Early Planting of Maize.**—The work at Potchefstroom has shown that early planted maize is less heavily attacked by witch weed than late planted maize. This is thought to be due to the fact that in the early part of the season the temperature of the soil is not sufficiently high to provide the best conditions for the germination of the witch weed seed.

Except where pests such as "stem borer" are prevalent, it has been repeatedly demonstrated in this country that on land free from witch weed early planting gives greater yields of maize under average climatic conditions than later planting, and this is an additional reason for recommending early planting where the land is infested with the parasite.

**5. Wide Spacing of the Maize.**—Saunders' experiments have also shown that the thicker or closer the planting of the host crop, the more heavily is the crop attacked by witch weed; and conversely, the wider the spacing of the host crop, the less is the crop attacked by witch weed.

From this it would appear that the farmer endeavouring to produce a crop of maize on heavily infested land would be well advised to use a comparatively wide spacing, such as 48 inches by 24 inches, and at the same time to apply a

generous dressing of quick acting fertiliser, sown in the drills with the maize.

**6. Check Row Planting in Dry Soil.**—It has already been pointed out above how check row planting of maize, combined with the use of single draught animals for cultivation of the crop, will reduce the amount of hand cultivation necessary to prevent the witch weed plants seeding.

If the check row planting of a section of the maize lands is done before the rains arrive, additional advantages of the practice are that the earliest possible germination of the maize is obtained; the farmer is assisted in getting the remainder of his maize lands planted early, as he has a smaller acreage to plant after the rains arrive, and a good stand of strong plants is assured. These are all points of the first importance.

**7. Types of Cultivator for Destroying Witch Weed.**—The more or less vertical straight point on cultivators which tears its way through the soil is unsuited to the eradication of witch weed. What is required is a type of point which has a horizontal cutting edge, such as the flat duck-foot point, so that the stems of the weed are severed well below ground level.

Upright points with a tearing action do not cut the stems of the weed, and the majority of the plants are merely pushed aside and continue growth without much interruption.

**8. Spike-harrowing over the Growing Maize.**—Weed growth in maize lands is one of the chief factors militating against the production of good yields of maize, and the writer is of the opinion that greater use might well be made of *light* spike harrows for harrowing maize lands immediately *following the planting of the seed, and once, twice or even three times over the top of the growing crop, up to the time* the plants are about 12 inches high.

*If* spike harrows are used in this way the weeds are *caught whilst in the seedling stage,* when they are easily destroyed; and if one or two spike-harrowings are done in this way, the subsequent crop of weeds will seldom give much trouble to destroy by inter-row cultivation. The maize should only be spike-harrowed in the heat of the day, when

the plants are wilted and so do not break easily. A spike harrow of three sections, weighing 200 to 220 lbs., is suited to this work.

In conclusion, the writer desires to emphasise the grave necessity for the maize farmer taking all possible steps to combat the attacks of this very serious pest of his major crop. Every farmer should take steps this season to acquaint himself with the characteristics of the parasite, not only when it is in flower, but before it comes into flower, so that he can early detect its appearance in his land and take immediate steps to destroy it.

The writer has found witch weed on a number of farms where the owner was unaware of its presence merely because he was unable to recognise it.

Finally, each farmer should realise that he owes it to his neighbour to eradicate witch weed on his own farm, since neglect to do so may lead to the infestation of the adjacent farms.

# Salisbury Experiment Station.

## FOR SALE.

### KUDZU VINE CROWNS.

A limited quantity of kudzu vine crowns will be available for sale during January at the following rates:—

| | |
|---|---|
| Large crowns ... ... ... | 6d. each. |
| Small crowns ... ... ... | 3d. each. |

Prices are carriage free to any station or siding in Southern Rhodesia.

**Purchasers are recommended not to plant small crowns, except on land which can be irrigated. Orders with remittances should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury.**

# A Note on Sheep Diseases in Southern Rhodesia.

By D. A. Lawrence, B.V.Sc., Veterinary Research Officer, Department of Agriculture, Salisbury.

It is not my intention to attempt to write about the suitability or otherwise of Southern Rhodesia as a sheep-raising country. It is quite apparent that this industry is on the increase, and I think that all those who are at present, or intend to become, engaged in it would be well advised to gather all the information they can on the question of "diseases," as the success of the venture must depend on the health of the flocks.

In this article attention will be drawn to some of the more important and common diseases met with in this country, and particularly to methods of diagnosing, preventing and treating these conditions.

**Verminosis or Infestation with Worms.**—This condition is undoubtedly the most important one and will be dealt with first. The study of worms in sheep, however, is so vast that it will be necessary here to limit the remarks to only those worms which constitute the greatest menace.

*Round Worms.—Wire Worm (Haemonchus contortus).*— The wire worm is easily recognised by its site in the animal, its size and marking. It is found in the fourth (or true) stomach, which joins the intestines, often in a reddish-brown mass of material, is slightly over an inch in length and about the thickness of an ordinary sewing needle. A large number of them (the females) show a spiral striation which gives them the appearance of a barber's pole; this is due to the white ovaries being rolled round the intestine, which is red with the blood taken in by the worm in sucking the lining of the stomach of its host, the sheep.

*Nodular Worm* (*Oesophagostomum columbianum*).—Unlike the wire worm, this worm is not a blood sucker, but nevertheless it is of great importance on account of harmful effects produced in other ways. The adult worm is found in the large intestine, usually in greatest numbers in the cæcum or blind gut. It is almost an inch in length, about the thickness of a darning needle, white in colour and usually straight and stiff, with the front end slightly bent like a hook or, when still alive, slightly curled up.

As already mentioned, the worms are not blood suckers, but in the early stages of development they cause considerable damage to the intestinal wall, both the small and large intestines being involved, by forming the characteristic hard nodules. In bad cases the nodules may be so numerous as to make the intestine quite stiff, and hence interfere with its normal function to a considerable extent. In fact, in some cases interference is so great that one part of the bowel may become telescoped into another, resulting in a complete blockage of the canal. Apart from the damage done by the young worms to the bowel wall, it appears that the adults are also harmful on account of setting up irritation and producing a substance which is poisonous to the sheep.

*Hook Worms* (*Bunostomum trigonocephalum* and *Gaigeria pachyscelis*).—These worms are also of considerable importance in Southern Rhodesia, particularly in wet or marshy areas. They are true blood suckers, and hence pink in colour, slightly under an inch in length and moderately thick. They occur in the small intestine, in the first part of which are the Gaigerias and in the last part the Bunostomes. Here they are firmly attached to the bowel wall, sucking blood. In those parts of the bowel where the worms are found one sees numerous tiny blood spots or hæmorrhages, which result from the worms puncturing the lining of the wall and injecting into it a substance which prevents the blood from clotting while they suck. This substance, apart from the damage it causes through preventing clotting and hence allowing hæmorrhages to occur, also acts as a poison to the sheep.

*Tape Worms.—Intestinal Tape Worms.*—Tape worms are easily recognised by their characteristic flat and segmented appearance. Owing to the fact that the life

histories of the various species of these worms are not yet known, and that the treatment at present adopted is the same for all species, it is unnecessary for the farmer to know how to differentiate between the various tape worms. However, it may be pointed out that there are two main types: the broad tape worms, which also infest cattle and are the more serious, and the narrow sheep tape worms. The effects of tape worms are not nearly as serious as those of the round worms, but nevertheless their presence is undesirable, as they lead to unthrifty condition, purging and the appearance of pot-bellies in lambs.

*Liver Tape Worm* (*Stilesia hepatica*).—This very narrow thin worm occurs in the bile ducts of the liver, in which it sets up a thickening on account of irritation. Unless occurring in large numbers sufficient to cause blockage of the bile ducts, it appears to do no harm. Its life history is unknown, and owing to its relative harmlessness, treatment has not been attempted.

*Tape Worm Cysts*.—Apart from the above tape worms, which are parasitic in their adult stages in sheep, we meet numerous developmental stages (cysts or bladder worms) of tape worms, which when mature are parasitic in other animals, *e.g.*, the bladder worm stage (*Cysticerus tenuicollis*) of the dog tape worm (*Taenia marginata*) is recognised as a large cyst in the peritoneum, or more rarely the pleura of sheep and other ruminants. But these are as a rule only of importance in so far as the control of the tape worm in the primary host is concerned. One, however, *Taenia coenurus*, a tape worm of the dog, deserves special mention, as its larval stage (*Coenurus cerebralis*) occurs as a cyst in the brain of sheep and may set up a nervous affection known as gid or sturdy.

*Flukes.—Liver Fluke* (*Fasciola gigantica*).—These worms live in the bile ducts of the liver and are readily recognised on account of their flat and leaf-like appearance. They are brownish in colour, about two inches long and about three-eighths of an inch broad when flattened out, the lateral margins being approximately parallel. They produce marked changes in the liver on account of the thickening of the bile ducts and degeneration of the liver tissues, and are also responsible for anæmia and unthriftiness. It appears

that liver flukes are more common in cattle than in sheep in Southern Rhodesia.

*Paramphistomes.*—These parasites are small flukes which occur in the rumen (paunch) of sheep. They are about the size of a pea, pear-shaped, pink in colour, and are found, in fresh cases, closely attached to the lining of the stomach. They do not appear to cause any bad effects, although cases are on record where the young stages of these parasites have developed in the intestines and set up severe irritation, loss of condition and even caused death.

**Symptoms.**—For the purposes of this article it will not be necessary to describe in detail the symptoms which may be observed in animals infested with the various worms or symptoms manifested at various stages of infestation with any particular species of worm. Even when such details are available it is extremely difficult, if not impossible, to diagnose in the living animal the particular worm with which it is infested.

Suffice it to say in general that wormy sheep do not thrive, suffer from digestive disturbances (diarrhœa or constipation), become anæmic, the mucous membranes appearing pale, bleached and porcelain-like, lose condition to such an extent that they appear to have no flesh on their bones, and develop œdematous swellings of a jelly-like consistence on the lower parts of their bodies, particularly under the jaw (so-called bottle jaw). In times of drought and scarcity of grazing such animals cannot stand the hardships to which they are submitted, and die in such numbers and in such a short space of time that the farmer is apt to believe that a new infectious disease has suddenly appeared in his sheep.

Under conditions of plentiful grazing and satisfactory weather even badly-infested sheep may not show any untoward symptoms, as their general good state of nourishment enables them to withstand the effects of the parasites, but when adverse conditions obtain they rapidly break down under the strain imposed on them.

**Diagnosis.**—As already indicated under the previous heading, symptoms alone are not sufficient to allow of a definite diagnosis being made. From a consideration of symptoms one may be able to say that the sheep are wormy,

but for purposes of treatment and prevention one must know which are the worms responsible.

For this purpose a thorough post-mortem examination is undoubtedly the most satisfactory method. Where one is dealing with worm-infested flocks no difficulty is experienced in obtaining carcases for such examinations. However, an animal which has actually died as a result of the infestation is often not as suitable as one slaughtered before the final stage of the disease has come about. The reason for this is that commonly, shortly before death, diarrhœa is so pronounced that the parasites are passed out in large numbers, and the few that are left in the intestines at death may easily be overlooked at a post-mortem examination.

I do not intend here to describe the best method of conducting a post-mortem examination, but I would urge upon all the necessity of doing it thoroughly. When searching for worms it is essential that the stomachs and intestines be opened completely (ball-pointed scissors are the best instruments for this purpose) and all portions thoroughly examined in a good light. In examining the liver for tape worms, flukes or cysts one should remove the organ from the carcase, inspect its surface for thickened bile ducts and then incise it in numerous places, squeeze it and watch the cut surfaces for any flukes or tape worms which may be thus expressed. When worms are found, particular attention should be paid to the site in which they occur, whether they are free in the bowel canal or attached to the bowel wall, and then from a consideration of their general size, shape and colour one should be able to identify the species from the description given above.

**Life History and Development of the Worms.**—Before proceeding to the all-important questions of treatment and prevention it is necessary that the life history and development of the parasites, and hence the way in which infestation occurs, be considered, as it is on these facts that the principles of treatment and particularly of prevention are based.

(a) *Round Worms.*—Eggs are passed out in the fæces, the number depending on the number of adult female worms present in the sheep; in some cases one female round worm may lay as many as 10,000 eggs in a day, and hence it is

no exaggeration to say that a wormy sheep may be passing out in its droppings a quarter of a million worm eggs daily. Under suitable conditions of warmth and moisture these eggs hatch, the young larvæ emerge, undergo development, moulting a certain number of times, until finally they reach a stage where they are capable of infecting another animal. Having reached this infective stage they crawl up blades of grass and are swallowed by the sheep during grazing. Under adverse conditions, however, the larvæ, instead of crawling up the grass, creep down into the soil for protection, and may remain alive in this way for a considerable time.

Temperature and moisture were mentioned as conditions suitable for the development of the young worms outside the animal body; thus it will be realised that the greatest danger of animals becoming infected is in the wet summer months. Dry winter conditions are unfavourable for worm development in the veld, and it is in the summer months particularly that sheep should be cleaned by regular dosing, and thus the infection of the veld kept as low as possible.

Having arrived in the stomach or intestine of the host, the larvæ undergo further changes and grow into adult worms, the females are fertilised and eggs are laid and the life history is repeated.

Differences in the development of the different species of round worms do exist, and it is important to note that, in the case of the nodular worm, the larvæ when swallowed burrow into the wall of the intestine, and it is here that they undergo further development before emerging into the lumen of the bowel to become adults. It is on account of this peculiar development that the typical nodules are produced in the bowel wall.

In the case of hook worms, moisture is even a greater factor in development than in the case of the other round worms, as they are considerably less resistant to drying, and hence sheep usually become infected only in moist pastures. Here also it is possible that, besides becoming infested with hook worms by swallowing them, the sheep may be infested by the larvæ burrowing through the skin and reaching the intestines via the blood stream.

(b) *Flukes.*—As with round worms, eggs are laid by flukes and reach the intestines via the bile ducts, as is the

case with liver flukes, or directly through the four stomachs in the case of paramphistomes, and are passed out in the droppings of the sheep. Fluke eggs which fall on dry ground do not hatch, but those which come into contact with water or moist earth, under suitable conditions of temperature, develop, and small embryos emerge. In this case, however, unless the embryos find a suitable intermediate host, e.g., certain species of aquatic snails, they succumb. Given the suitable snail, the embryos burrow into the body cavities of this new host, and here undergo numerous developmental stages, until they finally escape and swim about energetically in the water, eventually finding their way to an aquatic plant or grass stalk. Here they change into cysts which are firmly attached to the grass, and, on being swallowed by the sheep in grazing, pass through into the stomach. The cysts are dissolved by the gastric juices, and the young parasites thus set free migrate to their particular sites and develop into mature flukes, and the life cycle is repeated.

Thus one sees that, as snails are essential for the development of flukes, attention must be paid not only to the primary host, the sheep, but also to the intermediate host, the snail, when one wishes to eradicate this parasite from a flock.

(c) *Tape Worms.*—It is interesting to note that tape worms do not lay their eggs. The eggs develop in the posterior ripe segments of the worm, and the whole segment or even a few segments joined together are cast off and pass out in the fæces.

From this point onwards the life history of tape worms which are actually parasitic in their adult stages in sheep is unknown, but it would appear from a study of other tape worms that an intermediate host is required.

It has already been mentioned that the cysts which occur in the body cavities of sheep are really developmental stages of tape worms of other animals, especially the dog, and in these cases attention must be paid to the eradication of the parasites from the primary host, and of course to prevention of re-infection of this animal, by complete destruction of the cysts which occur in the sheep.

**Methods of Treatment.**—With verminosis, as with all other diseases, it is regarding treatment that advice is most

often sought, but the saying that "prevention is better than cure" is just as true in dealing with worm infestations as with other conditions.

Perhaps it is fortunate that treatment and prevention are closely linked together in controlling worms, as treatment, to be of any use, must be applied on several occasions, and this of necessity brings about practice of preventive methods.

However, methods of treatment of the various types of verminosis will be briefly considered separately, and therefore, as already indicated, one will realise the necessity of accurately diagnosing the species of worm responsible.

(a) *Wire Worm.*—The use of the Union "Government wire worm remedy" (also known as "Theiler's wire worm remedy") is particularly recommended. It may be obtained from the Veterinary Department in Southern Rhodesia, and with it a pamphlet giving detailed instructions for its use. It is unnecessary, therefore, to describe this method further.

It might, however, be pointed out that numerous other methods of treatment are advertised, and it would appear that some of them are beneficial; but still, on account of its known efficacy, ease of administration and low cost, Government wire worm remedy is preferred.

Further, this remedy, although as the name implies originally devised to destroy wire worms, is also effective to a certain extent on other worms, and improves the general tone of the sheep.

The practice of dosing sheep with Government wire worm remedy on their arrival in a new area appears to appreciably reduce the losses usually occasioned through such change of pasture.

(b) *Hook Worms.*—Carbon tetrachloride is the most useful remedy for these worms and is easily administered with a syringe. The drug, which must be pure, as the ordinary carbon tetrachloride used for cleaning purposes contains poisonous impurities, can be obtained from chemists in 1 lb. bottles at a reasonable price.

The drug is poured into a cup, or preferably a vessel which can be kept closed to minimise evaporation, and the dose—3 to 4 c.c., depending on the size and condition of the sheep—is drawn up into a 10 c.c. syringe (without

needle), the rest of which is then filled by drawing in milk from another vessel. The sheep's mouth is opened and the mixture slowly squirted in along the side of the cheek.

Dosing is best carried out in the early morning, and the animals may proceed to water and grazing at once, but should not be exerted during catching for dosing or for the next day or two. On badly infested farms dosing should be repeated every six weeks during the wet summer months or when the pasture is moist. It is advisable to dose, say, ten sheep first and note whether any adverse symptoms appear before proceeding to dose the whole flock, as occasionally, when the sheep are very weak or on certain pastures, the drug produces adverse effects.

Carbon tetrachloride is also effective in the treatment of fluke.

(c) *Nodular Worm.*—At present no drug is known which is effective when given by the mouth. The worms are situated so far back in the bowel that any drugs which might have been suitable are so changed by the time they reach the worms that they are useless. It is therefore necessary to attack the worms from the other end by means of enemas. This task is not quite as formidable as might at first be thought, and the good results obtained adequately compensate for the difficulties of carrying out the treatment on badly infested sheep.

The apparatus required for giving the enema consists of a large syringe or enamel funnel, to the end of which is attached a 3-foot length of ½-inch rubber tubing. The enema fluid is prepared by dissolving ½ oz. of bicarbonate of soda in 2 pints of lukewarm water, and adding to this 10 c.c. of "liquid Union wire worm remedy." The liquid wire worm remedy may be prepared from the powder form by adding 15 c.c. of concentrated hydrochloric acid to 1 litre (1,000 c.c.) of clean water in a glazed china, porcelain or enamel pot, and dissolving in this 1 tin of the powder. The sheep is then grasped by the hind legs and held upside down while the operation is carried out. The rubber tube, which is smeared with vaseline or oil, is inserted through the anus, pushed forward as far as it will go, and held in position by closing the anus round it with the fingers. The enema fluid, 2 pints for an adult sheep and slightly less for small animals, is

then poured in through the funnel or squirted in with the syringe, and the sheep's abdomen is pressed and rubbed for about half a minute to assist the forward flow of the fluid. The tube is then withdrawn and the sheep released.

Sheep that are purging, as they often do when infested with nodular worm, are most successfully treated, and therefore for a day or two before such treatment is undertaken they should be fed on laxative foods. Where a constipated animal is to be dealt with it is advisable to give an ordinary soapy water enema a quarter of an hour before treatment.

This method of treatment has been found successful, even in cases where weakness has progressed to a considerable extent.

(d) *Liver Flukes.*—As already mentioned in connection with the hook worms, carbon tetrachloride is the drug recommended. It is administered as already described, but the dose may be reduced to 2 c.c. Treatment should be repeated every four months on badly infested farms.

**Preventive Measures.**—*Preventive Treatment.*—From the outline of the life history, method of infection and the manner in which worms produce their effects, it will be readily understood that to make sheep farming profitable, prevention of infection with worms must be rigidly carried out. It is little use cleaning a flock by treatment and immediately exposing them to re-infection. However, as it is not a practical proposition to completely eradicate infection from the pasture, infestation of sheep will continue to a certain extent, and hence treatment must be regularly practised. By so doing one is also carrying out a definite preventive measure, as the sheep serve to collect worms from the veld in their bodies, and here one is able to destroy them before they reach a stage where they are capable of setting up further infection of the veld. The similarity between this method of eradicating worms and the method of eradicating ticks by dipping will at once be realised, the animal serving as a means of collecting the parasites off the veld and keeping them until they can be destroyed. Treatment, therefore, is one of the first considerations in prevention, and should be carried out regularly throughout the wet summer months, when worm life on the veld becomes most active. To put this principle into general practice one should

dose the sheep with Government wire worm remedy every three to four weeks from the time that the veld becomes green in spring until it gets dry in autumn. This might be considered to apply to worms in general. Where, however, one is dealing with hook worms and fluke, carbon tetrachloride should be administered as already indicated under the previous heading.

*Pasture and Water.*—It has been emphasised that moisture is essential for the development of worm larvæ on the veld. In consequence of this one should as far as possible graze the flock on the dry, high-lying parts of the farm and keep them off moist vleis or river beds. Further, it is advisable to water from troughs and thus ensure that they do not graze round damp areas.

With regard to live fluke, should this practice be adopted one is sure to prevent infection, as the young flukes cannot develop without aquatic snails. In this connection it may be pointed out that the addition of copper sulphate in a dilution of one in a million to swampy pastures or pools destroys the snails and is harmless to stock in this strength.

*Preventive Licks.*—Licks do not appear to have any marked effect on parasites which have already matured in the sheep, but they certainly do have some effect on young parasites just entering. A lick consisting of tobacco, bone meal and salt is apparently effective, and may be prepared by mixing together 1½ lbs. of coarsely cut and moistened tobacco, 3 lbs. bone meal and ¾ lb. of salt, and allowing this quantity per 100 head per day. The sheep should be allowed access to this every morning before going out to graze. A lick consisting of bone meal, copper sulphate and salt is considered particularly beneficial in dealing with fluke infestation.

It is well known that sheep in good condition are better able to withstand infection than poor ones, and sheep in low condition should be assisted with a lick consisting of three parts bone meal, three parts salt and one part of iron sulphate.

**Lambing, Pasture Rotation or Paddocking.**—As lambs are more susceptible to the adverse effects of worm infestation it is advisable to arrange for winter lambing. This will

then give the lambs an opportunity of starting life when worm infection on the veld is more or less absent.

By dividing the farm into three paddocks one can carry out very successfully a method of pasture rotation which will allow the lambs to reach the age of eighteen months and thus be past the most dangerous age before they are exposed to infection. One camp may be regarded as the main grazing ground, the other two being merely lambing camps, only one of the latter being used each year. The ewes are removed from the main camp to a lambing camp at the end of the rains. They lamb down in winter and remain with their lambs until just before the next rains, when they are returned to the main camp. Although they may be infected, any eggs passed out do not hatch in the cold, dry weather, and infection of pasture is stopped before the favourable hatching season commences. The lambs remain in the camp until the following winter, i.e., when they are a year old, and are then put in the main camp and are eighteen months old when the infective summer season arrives. The other lambing camp, which has been kept free from all sheep, cattle and goats for a year, is then also clean and is used for the next season's lambing. Thus two camps are kept clean and used for lambing in every alternate year. This method can only be adopted where over-stocking is not practised.

Worms, although they gain entrance to an animal in summer, usually produce the most marked effect in winter, when the sheep are in low condition. It is therefore essential that adequate winter feeding should be supplied. This cannot be done on over-stocked farms. One should always make provision for sufficient good winter grazing, and if necessary supplement the grazing with extra feeding, and thus maintain the condition of the flock.

**Sheep Nasal Fly.**—Most sheep breeders are familiar with the symptoms shown by animals infested with this parasite, namely, thick, slimy or purulent discharges from the nostril, difficult breathing on account of clogging of the air passages, and attempts to clear the nostrils by shaking the head or rubbing their noses on the ground or against the forelegs.

The condition is brought about by the presence in the nasal passages of larvæ or maggots of a certain fly, *Oestrus ovis*. This fly, which is present in the summer months, deposits its eggs or larvæ on the nostrils, and the young

maggots crawl up into the nasal chambers, or even further, and become attached to the mucous lining of the cavity. Here, on account of their hooks and spines, they set up considerable irritation and cause the above described symptoms. The larvæ in this position undergo development for eight to ten months, and when mature, release their hold, crawl forward and are sneezed out. On the ground they burrow into the soil or crawl into a sheltered place and pupate, the adult flies later emerging from the pupæ.

The condition is readily diagnosed from the symptoms or by finding the maggots in the nasal cavities or discharges. Treatment is cumbersome or even dangerous, and one should therefore only attempt prevention. This consists of the application of a fly repellent to the nostrils of the sheep and is most easily effected by allowing the sheep daily access to troughs containing licks, the sides of the trough being smeared with tar. A V-shaped narrow trough is the best for the purpose, as when the sheep put their noses down to reach the lick they get them smeared with the tar.

**Quarter-Evil (Black Leg or Quarter Ill).**—It does not appear to be generally known that sheep as well as cattle are susceptible to quarter-evil infection under natural conditions. The disease is caused by a specific bacterium, which, in sheep at least, seems to be capable of setting up infection only when entrance to the body is gained through wounds or injuries. Hence the disease is closely associated with such operations as shearing, docking and castration. It is not uncommon to find hides from beasts which have died from quarter-evil stored in sheds in which the above-mentioned operations are carried out. One will readily realise that under such conditions the germs from these skins will be floating about in the dusty atmosphere, and in consequence a large number of animals may become infected at the same time. The symptoms are well known to most farmers. In the first stages it may be noticed that the animal is off its feed and dull. Soon a high fever sets in, and in most cases a typical swelling appears on some fleshy part of the body, usually the quarters, and, when such is near a limb, marked lameness is evidenced. The swelling is fairly soft, and on pressure emits a crackling or crepitating sound. Death occurs in a day or two, recoveries being very rare. At post-mortem examination one is usually struck by the peculiar typical sour smell, like rancid butter. On cutting into the

swelling one notices just under the skin a watery or jelly-like layer, yellowish or red in colour; the flesh appears dark red or even nearly black, and the fibres of the muscle are separated by gas bubbles. The internal organs as a rule do not show any typical changes, though occasionally some of the organs, such as the spleen, may be swollen and dark and may contain gas bubbles.

In order to make certain of the diagnosis, smears prepared from the spleen and the affected muscle should be forwarded to the Department of Veterinary Research, where they will be examined and reported upon free of charge.

Treatment need not be considered, as it is practically useless. Prevention, however, is very successful, and consists of proper disposal of carcases and all infected material by disinfection, burying or burning, and of preventive vaccination. A most reliable vaccine is issued by this Department at the very small price of 1d. per dose for sheep or 3d. per dose for cattle. This vaccination should be carried out on all susceptible animals yearly on infected farms.

**Blue Tongue.**—Blue tongue is a specific disease of sheep which is caused by an ultra-visible filterable virus, i.e., the causal germ cannot be seen or isolated, although its presence in the blood of an infected animal can be proved. The disease is not contagious, and, as is the case in horse-sickness, appears to be transmitted by some flying insect. It would appear that a certain species of mosquito which flies only at night—or in the early morning and evening—is responsible for the appearance and spread of the disease. The disease occurs in the wet summer months and is most common in very wet years; in fact, some such seasons are actually referred to as blue tongue years.

A few days after the sheep has been infected, fever develops, but it is only after a further period of a week or more that the typical symptoms are observed. In some cases the animal even recovers before the appearance of such symptoms. In the more severe forms, however, the sheep start licking their lips, and the lining of the mouth, tongue and nose becomes reddened and the lips start swelling. After this there is a frothy discharge from the mouth, and later the colour of the swollen membranes changes to blue, and ulcers and hæmorrhages may even occur. On account of the swellings, difficulty in breathing is shown. Occasionally a blood-stained diarrhœa supervenes, and one may

also observe swelling and inflammation of the claws, and even shedding of the latter. Great thirst is shown throughout the disease. The disease usually lasts two or three weeks, when recovery or death supervenes.

The mortality is as a rule not high, and the loss in mutton and wool is generally more severe than the loss by death. Diagnosis is usually easy on account of the typical symptoms and the time of the year at which the disease appears. Treatment consists of hygienic measures of isolation, stabling, good food and provision of salt to improve the gums. Where individual sheep are to be treated a mouth wash of alum is beneficial.

Here again, however, one should endeavour to prevent the disease. Prevention is a comparatively simple matter. The sheep should be kraaled early in the evening and let out to graze late in the morning. This will enable them to bunch together and thus minimise the chances of being bitten during the time when the transmitting insect is about. Further, the blue tongue vaccine issued by the Union Division of Veterinary Services, and obtainable from the Rhodesia Veterinary Department, is very effective and should be used just before the blue tongue season commences, i.e., October to November. Inoculation should not be carried out on freshly shorn sheep, and one is advised to wait at least three weeks after inoculation before shearing.

**Conclusion.**—A considerable portion of this article has been devoted to the consideration of verminosis or diseases due to worms. This undoubtedly appears to be the greatest menace to the sheep farmers at present, and one cannot over-emphasise the necessity of adopting preventive measures before the great problem becomes still greater.

Apart from the diseases mentioned, however, one should not lose sight of the danger of losses due to other diseases, such as anthrax and heartwater, the latter only occurring in areas where the bont or variegated tick exists. Other factors, such as abscesses due to injuries by the striped leg tick, skin troubles due to grass seeds, external parasites, scab, keds and ticks, screw worm or blow fly maggots and poisonous plants, must also be borne in mind if the sheep industry is to thrive, as it is to be hoped it will.

**References.**—Numerous articles by various officers of the Department of Agriculture, Union of South Africa.

# The Practice of Contour Ridging.

By J. S. Chilcott, Banket.

While interest in contour ridging is certainly widening, the practice of it is still virtually confined to one or two small areas where the ravages of soil erosion have become intolerable. Its general adoption may yet prove disastrously slow; but there is no valid reason why it should, for contour ridging is simple and cheap and in every way well adapted to our present extensive methods of agriculture.

The principles of contour ridging have been so clearly explained in various departmental bulletins that there would be little point in my touching on them here. What I propose to do is merely to give some account of conditions and methods on this farm and attempt to answer from personal experience certain objections to contour ridging that I have heard raised by farmers who as yet have had no opportunity of inspecting a system of ridges during wet weather.

The soil here is the typical deep red of the maize belt, with a porous gravelly sub-soil. The average natural fall of the lands so far ridged is 1 in 50, though in places the fall approaches 1 in 25.

Our first ridges were surveyed off for us by an engineer of the Irrigation Department. They were given a grade of 1 in 400 and spaced 150 yards apart. The average length of a ridge of this system is 500 yards, and the dimensions are those recommended in the bulletins. After having watched these ridges during some heavy mid-season downpours I have no doubt that they will easily resist the most severe strain ever imposed upon them. So their performance has furnished us with useful data for the construction of other systems of ridges on this farm.

Anyone who can obtain the use of an engineer's level will find the work of marking out contour ridges to be simple

enough, calling for no special skill. A level that will serve the purpose is to be had in Salisbury for £15 or thereabouts. This and a home-made staff of 4 inch by 2 inch deal, say 7 feet long and marked in feet and tenths of a foot, will be found to give the necessary degree of accuracy. When conditions of light and ground are favourable I find that I can without difficulty mark out 1,500 yards of ridging in a day, fixing pegs, with level and boning rods, at 50-foot intervals and making small final adjustments to the peg line. If the field to be ridged has suffered to any marked extent from erosion, the surveying does not proceed at anything like this pace.

For throwing up the ridges in the rough we use a Martin ditcher drawn by eight or ten good oxen. A boy rides on the ditcher to weight and balance it and another stands by with a mattock to remove the roots and stones that it exposes from time to time and tends to shy at. Since accuracy in the early cuts is all-important, it is well to have a good driver and a grown boy as a leader. The best way to work the ditcher is from the inside outwards, making the first cut as near the peg line as possible and opening the scraping arm out a hole every second or third circuit. If the ditcher work is good the subsequent labour of trimming the ridge with hand implements will be very light indeed.

It may not be amiss here to give a few figures relating to our costs of construction. These are necessarily only approximate, and are not designed to contradict figures already given by others.

Cost of Constructing a Contour Ridge 500 yards long.

| | | | |
|---|---|---|---|
| Pay and food of four boys working with ditcher for two days at 10d. per boy per day ... ... | £0 | 6 | 8 |
| Value of ox labour for two days, say ... ... ... ... | 0 | 10 | 0 |
| Depreciation on ditcher and other equipment, say | 0 | 2 | 0 |
| Pay and food of eight boys working with hand implements for two days ... ... ... ... ... ... | 0 | 13 | 4 |
| Total ... ... ... ... ... ... | £1 | 12 | 0 |

If the ridges are spaced 150 yards apart, then 500 yards of ridging will protect a little more than 15 acres of land, so the cost of protecting one acre works out at something like

2s. 1½d. When we reflect on the cost of ploughing, fertilising or stumping, this figure seems almost insignificant.

I have heard it objected against contour ridging that it must seriously complicate the operations of ploughing, harrowing and the like. This objection strikes me as almost a captious one. Surely the implement should be accommodated to the land rather than the land to the implement. Further, which is better: To work a field that is being constantly reduced in fertility by erosion and irregularly scored with sluits, or one that is protected from erosion by evenly spaced ridges? However, if it comes to the point our experience is that the extra labour involved in working a ridged land is not nearly so great as is commonly supposed. It must be remembered that contour ridges, containing as they do the four adjustable elements of length, size, grade and spacing, are infinitely adaptable things. A very little preliminary thought will reveal an arrangement of ridges convenient to the working of most fields. I do not think it good practice to work a heavy implement across a ridge, but to travel one across (so long as the ridge is well settled) can do little harm.

Another objection that I have heard is that in a very wet year contour ridging might tend to produce waterlogging in a field. I do not think this need cause anxiety to anyone. Occasionally, where a ridge has been built up to carry it across a small sluit, a pool will form and stand for some time, but pools of this sort will not often be so large or numerous as to inflict any appreciable loss in yield.

In conclusion I should like to say that I am well aware that a number of farmers in this country are better qualified than myself to write an article of this sort. That these have not written is my excuse for doing so.

# The Citrus Industry in Southern Rhodesia.

*(The following is a report furnished by Mr. V. A. Putterill, Chief Fruit Inspector at Capetown Docks, on a recent visit to this Colony.)*

In reporting on my recent visit to the chief citrus areas in Southern Rhodesia, I feel I am not justified in attempting to give you anything much more than simply my general impressions. Had I found the citrus industry there in an obvious state of chaos, with marked inefficiency in any or all departments, the case would be entirely different, notwithstanding a realisation of the fact that a visit of three weeks' duration is sufficient to give one only a glimmering of what problems the Rhodesian grower has to face.

Fortunately I found anything but inefficiency. In fact what struck me was the business-like and efficient way the citrus industry is being managed. I do not wish to imply that there is no room for improvement in any of the citrus estates I visited, because there is in some marked evidence of past mistakes, but it was clear to me that these mistakes are acknowledged, and that the problems they have brought in their train are being squarely faced by those concerned. I was privileged to meet a number of the officers of the Rhodesian Department of Agriculture, so I know the scientific problems are in good hands. The Department of Agriculture of a big but young country such as Rhodesia does not find it possible, I expect, to devote the activities of any of its scientific staff entirely to the citrus industry. The fact that the company most interested in the citrus industry in Rhodesia has its own highly qualified scientific research officer (Dr. Hall) proves conclusively to my mind that the value of and need for scientific research are fully realised and that the industry is prepared to fight its own battles; this is in itself a tribute to the business-like and generous policy of those concerned. I use the word generous, because the very great

scientific and practical value of the work Dr. Hall is doing will help growers and scientific workers beyond the borders of Rhodesia almost if not as much as those within its borders. I should like to see the adoption of a similar policy in the Union; I expect it will come.

The varieties of oranges exported from Rhodesia during the past two seasons,* together with the quantities of each in terms of shipping tons of 40 cubic feet, are given below:—

| Variety. | 1928. | 1927. |
|---|---|---|
| Washington Navel ... ... ... | 2,068 | 1,521 |
| Valencia ... ... ... ... ... ... ... | 5,433 | 4,488 |
| Seedling ... ... ... ... ... ... ... | 14 | 9 |
| Du Roi ... ... ... ... ... ... ... ... | 88 | 99 |
| Mediterranean Sweet ... ... | 420 | 382 |
| Jaffa ... ... ... ... ... ... ... ... ... | 273 | 169 |
| Paper Rind S. Michael ... ... | 10 | |

The Washington Navel and Valencia are thus at present the important commercial varieties. In regard to the relative merits of these two varieties, in so far as suitability to Rhodesian conditions is concerned, I am satisfied that the Valencia is by far the better commercial orange. The Valencia is, I think, normally a better coloured orange in Rhodesia than the Navel. The latter is at its best for eating purposes very often a considerable time before it is sufficiently yellow for export. When it does reach the required 70 per cent. colour standard, the flavour is inclined to be insipid. The rind and the flesh tend to be coarse; juice content is about normal for the variety. The quality of the fruit appears to be affected to a much greater extent by seasonal climatic conditions than the Valencia, and as a variety is more subject to insect pests and disease. The production of export fruit per tree is considerably lower than in the case of the Valencia in Rhodesia. The Washington Navel orange appears to be best adapted for conditions such as obtain in certain restricted areas in the Eastern Cape Province, where it is undoubtedly a better variety than the Valencia. In the Transvaal the Valencia is better than the Washington Navel, and I think this difference is even more accentuated as one

* These figures refer to export *via* Capetown. In addition, export *via* Beira amounted to about 20 per cent. of the quantities shipped from Capetown.

goes north. I ascribe the general poor colour of the Rhodesia Navel to the protracted growing period there and possibly there are areas in Rhodesia where this variety would be more satisfactory than it is at present. The Rhodesian Valencia is undoubtedly a good commercial orange, but even with this variety, in the event of a very early spring, trouble may be experienced in so far as colour and quality of the fruit are concerned.

I think the possibilities of mid-season varieties have not been sufficiently explored, and that a great effort should be made to find the best mid-season variety for Rhodesian conditions. I expect there is a lot of material in Rhodesia at present which is worth testing out, but the fear of new pests and plant diseases should not allow the door to be closed entirely to the introduction from elsewhere of promising varieties or strains. Close co-operation between the Rhodesian Department of Agriculture and the Departments of other countries, together with strict Government quarantine in Rhodesia of any introductions, should be an ample safeguard against this.

I have referred to the general lack of flavour in Rhodesian Navel oranges later in the season. There is in the Union, and I saw it too in Rhodesia, a type of Navel orange which is commonly called the "Australian" Navel. The tree tends to be an upright grower and produces a big but varying percentage of flat fruits. It is really not a satisfactory type of fruit for export. In the Transvaal it ripens much more slowly than the Washington Navel, but the juice is richer and more fully flavoured and the texture of the flesh very good. A Navel orange in Rhodesia with this internal physiological constitution, but without the undesirable qualities of the so-called "Australian" Navel, does not appear to me to be outside the realms of possibility at all.

Packhouse organisation and equipment in the main struck me as being very efficient, and that it is so is proved by the absence of mould wastage in consignments from Rhodesia when these are inspected at Capetown. I do not, however, like the brushing unit in several of the grading machines I saw, as I feel that, notwithstanding absence of waste in Rhodesian fruit at Capetown, it is a potential danger. The brushes do injure the fruit slightly, and in a season favourable to mould attack, this brushing could result in severe loss. It would not surprise me in the least if it were found out that this brushing is one of the main

reasons which have given rise to the view that the Navel orange in Rhodesia cannot be picked with safety for some three weeks after rain. This may be thought only a minor point, but I certainly urge that it be thoroughly investigated. Incidentally the biology and parasitism of the common moulds (*Penicillium* spp.) and of the sour-rot fungus (*Oospora citri aurantii*), which occasionally causes some loss, especially after wet weather, require further study, because a great deal less is known about these fungi than is generally realised.

I was glad to see the careful meteorological records that are being kept on one estate. Similar records should be kept in every big centre, as in any biological investigation, whether it be a study of some parasite or of some physiological trouble, to take fruit colour as an example, this information is fundamental; one can never say when such records may not supply the key to some problem. One's memory of the climatic conditions of past seasons, when not backed up by actual records, is apt to be somewhat illusionary.

It would be out of place for me to refer at any length to the many problems on which research is needed, because they are as obvious in Rhodesia as they are in the Union, and your workers are better able to speak of them than I am.

In regard to transport to Capetown, I am pleased to be able to say that the stowage in the trucks from Rhodesia is excellent, and that the general condition of Rhodesian consignments is so good that they might well be taken as a model anywhere.

My visit to growers in Portuguese territory was most interesting. The possibilities for citrus growing there are most promising. I saw some very good oranges and some particularly fine grape fruit there. Unfortunately there is obvious evidence in the groves of serious problems which require immediate investigation. I understand the appointment of a horticultural adviser has recently been or is about to be made by the Department of Agriculture there. This appointment is undoubtedly a most important step and will meet a real need.

I wish to take this opportunity of thanking the members of your Association, first, for their most generous hospitality, and secondly, for a perfectly organised tour, which I am afraid was of greater benefit to me educationally than possibly to them.

# Poultry Husbandry in Southern Rhodesia.

## HOUSING AND FEEDING OF ADULT STOCK.

### PART II.—FEEDING ADULT STOCK.

By H. G. Wheeldon, Poultry Expert.

Foods and feeding are important factors for good health and egg production and also for the maximum fertility and hatchability of the eggs from breeding stock. Poultry will survive and may keep comparatively healthy on fibrous and poor rations, but well-balanced, palatable and wholesome foods are necessary for maximum results from growing, laying or breeding flocks. The additional cost of a good ration compared with a poor ration is repaid many times by the increased number of eggs obtained. Well nourished birds are less susceptible to changeable weather and unseasonal moulting.

The production of eggs and market poultry is a process of transforming comparatively cheap feeds into remunerative products for human consumption. The fowl's body is the agent which effects this transformation. Poultry feeding should be based on the food requirements of the birds, the nutritive value of the different feeds and a knowledge of how to combine these for particular objects in view. At all times newly formed tissue is needed for replacement of the tissue destroyed by the general wear and tear of the body. The body also needs energy for the production of heat, which is necessary to maintain the body temperature.

For these purposes birds need a constant supply of food. If this supply should fail for any length of time the birds would begin to lose weight, cease laying and moult, then draw on their own body material until death ensues. This may occur within 34 days. If, on the other hand, the supply exceeds the demand—that is, more food is provided than is required for these activities—the body of the hen has the power either to manufacture eggs or to store the excess digested food as body fat.

There is undoubtedly no best ration for all conditions in feeding poultry, nor can any hard and fast rule be laid down. What may answer the purpose admirably for one poultry farmer would be quite unsuitable to the conditions of another in respect to what foods are most easily obtained at the least cost and to the conditions under which the birds are kept. For instance, birds in pens would require a different menu from those running on free range. The latter, if they have access to kraals and stables or other suitable ranging conditions, may require little or no food given to them, as they manage to obtain all the food they require and balance their own rations. On the other hand, birds kept in confinement will require to be supplied with all the food to meet their requirements, and balancing their rations has to be considered by the poultry farmer for the particular object in view.

The successful poultry farmer recognises that all kinds of wholesome poultry food which can be grown or which the market affords are not equally well suited to the fowls kept for the production of either eggs or meat. Careful consideration is given to the selection of food for the production of special products, and the ration must be made up with the view to producing either eggs or meat. A balanced egg-laying ration is a combination of feeds that furnishes just the necessary amount of nutrients—protein, carbohydrates and fat—to produce the highest and most economical egg yields, the ratio of which should be 1: 4.6, and for fattening birds, 1: 6.

If one desires to feed economically for egg production, and has learned little or nothing from experience, a most valuable lesson may be observed from nature. It will be seen that those fowls which have free range, and consequently

are not so far removed from the natural state, lay most abundantly in the spring. In this respect then the poultry farmer may profitably aim, so far as it lies within his power, to approach spring-like conditions throughout the year. Birds on free range are allowed to roam at liberty, and during the spring they will find abundant green food in the tender shoots of grass and other plants. They find meat food in the form of insects, grubs and worms. These, with grain in some form, make a most perfect food for laying hens. If the grain food is not supplied to them by the poultry attendant they will find it, if possible, in the form of seeds of various plants and in kraals, and will obtain abundant exercise in searching for it. In other words, when birds are kept in confinement it should be the aim of the poultry farmer to supply the needs, food and conditions which tend to produce eggs most abundantly according to the laying strain or qualities of the birds, and to induce scratching exercise by feeding the grain foods in litter to keep the birds in a good, hard, active laying condition. In this way, with proper housing during adverse climatic conditions, an effort can be made to prolong the spring the year round. Our present day pure breeds of poultry respond satisfactorily to this condition, having long been removed from their natural state and bred and reared under artificial conditions. When feeding fowls for meat production there is a difference so far as exercise is concerned.

Table fowls will require little or no exercise during the process of fattening, whereas young growing stock for the fattening pens will require exercise in the ordinary way to keep them in a healthy, vigorous condition. There are, however, certain general principles to guide the poultry farmer to obtain best results, and to which should be given constant close attention. The primary object of feeding is to transform the vegetable and animal feeds into finished products in the form of eggs or flesh which are edible and to keep the birds in a healthy, vigorous condition. There are many demands upon the constituents of the food we give to our birds, and in addition to satisfying the appetite there are several functions that food has to perform. It has to provide bodily warmth, repair the waste of tissue—a process which is constantly taking place—and to build up flesh. When these requirements for maintenance

are supplied, and not till then, the surplus of food goes to the development of eggs, and this surplus must be such as is suitable for the production of eggs, otherwise it will form fat. In the feeding of various classes of live stock the terms "maintenance diet" and "productive diet" are not infrequently used. For instance, the cow that is dry receives but a maintenance diet, the one in full milk gets "that little bit of something extra" to convert it into a productive one. The seeker of good egg yields is much in the same position, for there are many who feed a bare maintenance diet either in quality or quantity, and these wonder why their birds fail to yield up to their expectations. High egg producers are large eaters as a rule, and to obtain a good profitable egg yield the food should not be stinted.

The value of variety in feeding has long been realised. There is no one food which will answer every purpose; consequently to obtain all the bodily requirements a varied diet or mixed foods are necessary. There are many different ways in which the benefit of a change of food reacts on the system. If hens are not laying because of an unsuitable ration and a complete change of food be given, it will very frequently have the effect of bringing them on to lay. On the other hand, if they are in full lay a sudden change may have a deterrent effect and cause production to cease, and further, may cause the birds to moult. If a seasonable variation is methodically carried out it will not have this drastic effect, but will be more likely to maintain a steady average of eggs throughout the year.

The amount of food required for laying stock cannot possibly be fixed to the exact ounce and adhered to year in and year out, as so many suppose. Nothing could be more unfortunate than the widespread idea that each bird requires exactly four ounces of food daily and no more. Some are even afraid of over-feeding if they count in the green stuff. Although it is true that two ounces of grain and two ounces of mash appear to be an approximate average for good productive hens throughout the year, we must bear in mind that there are times when birds do not require so much and others when they require more. Very heavy layers have been known to consume 4½ ounces of concentrates as an average for the year. There are four factors which influence the

amount of food required: (1) Breed to some extent; (2) season of the year; (3) the amount of range, and (4) whether the birds are laying heavily or not. Those who read poultry text books will be familiar with the ever-present chapter on the composition of foodstuffs and albuminoid ratios. At one time the blending of foods to a correct albuminoid ratio was looked upon as the last word in scientific feeding. Certainly everyone should have some idea of the composition of the common foods in use, and so the principle is good, if only from an educational standpoint; but, like many other things, its utility is lost when carried to the extreme. It is necessary to quote only two reasons why it is not safe to rely solely on the albuminoid ratio as a basis for composing a poultry ration. The albuminoid ratio does not take into consideration (1) the fibre content, or (2) the mineral constituents. For example, a mash with a narrow ratio may be so loaded up with indigestible fibre that when the birds have filled their crops to the utmost they are unable to extract sufficient nourishment from it. Again, the quality of the albuminoids may vary considerably with the different foods; in some cases these are highly digestible, whereas others are not. In short, there are innumerable instances of two mashes having exactly the same albuminoid ratio, and one proves a good diet and is productive, while the other is just the reverse. As a rule poultry farmers are far better judges of stock than they are of foods to feed to that stock. Poultry farmers would be wise to refer to the analysis of the various foodstuffs and take the constituents more into consideration than to rely solely upon the nutritive ratio when balancing the rations for their birds.

**Mineral Foods.**—It has been wisely stated that "the more fowls are bred for maximum production, the more they are susceptible to disease, especially if they be improperly fed and too closely in-bred." In effect the susceptibility to disease or the lack of disease-resisting powers is the result of unbalanced feeding and breeding, with over-production. It is possible that the eggs from the very heavy producers may be lacking in certain elements which are essential to the healthy and vigorous development of the embryo chicks. For example, in the case of extensive egg production by breeding birds, such elements may be distributed in 60 eggs

instead of perhaps 40 eggs, with the result that the embryos are imperfectly nourished. Evidence of this may be found in comparing the earlier with the later hatched chicks. In spite of generally more favourable environment, the latter have not the vitality, neither do they grow as fast or ultimately obtain the same size as the earlier hatched birds, and we are forced to conclude that the later eggs are not so well supplied with the elements essential to vigorous development as are those which are laid earlier in the breeding season. Possibly the element which the egg of the heavy producer lacks more than any other is the mineral salts, and more particularly the lime salts, a part of which should always consist of oyster shell or unslaked lime.

*Mineral Salts.*

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| Carbonate of lime ... ... ... ... ... | 1 lb. |
| Bone ash or meal ... ... ... ... ... | 3 lbs. |
| Common salt (fine) ... ... ... ... ... | 1 lb. |

Mixed in 100 lbs. of mash mixture or mix well and add 3 ozs. to 10 lbs. of mash.

This mineral mixture may be incorporated in the mash for growing and adult stock with beneficial results. Weak chicks and dead in shell may be reduced considerably by the consistent use of this mixture in the diet of breeding stock. It offers a means of combating the evils which inevitably arise in the breeding season as the result of a long season or heavy egg production. The continuous use of these mineral salts is recommended in the diet for egg-producing hens and growing stock. It improves the quality of the shells of market eggs, hatching eggs are better stored with the elements required by the embryo chicks, and assists the growth and stamina of young stock.

*Potassium Iodide Mixture.*

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| Bone meal ... ... ... ... ... ... ... ... | 50 lbs. |
| Finely ground limestone ... ... ... | 23 lbs. |
| Common salt (fine) ... ... ... ... | 20 lbs. |
| Sulphur ... ... ... ... ... ... ... ... ... | 5 lbs. |
| Oxide of iron ... ... ... ... ... ... ... | 2 lbs. |
| Potassium iodide ... ... ... ... ... | 4 ozs. |

Dissolve the iodide in a cup of water and sprinkle over fine salt, then thoroughly mix all ingredients, or if desired, the iodine may be given alone: dissolve ½ oz. potassium iodide in a bottle of water, and one teaspoonful of this added to each gallon drinking water twice or three times weekly, and to every 100 lbs. of dry mash add 3½ lbs. of the above.

This mixture has a tonic and stimulating effect on young and old stock. It is likely to stimulate the production of eggs in laying stock. If used continuously in the mash for growing stock it ensures early maturity and premature laying in our warm climate, and for this reason its continuous use cannot be recommended unless the quantity is reduced to 2 per cent. instead of 3½ per cent. As a rule good results can be obtained by feeding it to young stock periodically. It has beneficial effects on birds that are affected by chicken-pox or may be used in their diet as a preventative. This mixture will assist the growth of feathers in the growing season, it will shorten the moulting period of individual birds and tend to keep the birds in a healthy condition.

*Salt* may be incorporated in the mash for adult or growing stock, but should always be evenly distributed or thoroughly mixed at the rate of 1 per cent. or 1 lb. of fine salt to 100 lbs. of mash, unless fish meal or other forms of animal food are used that contain salt, in which case the quantity of salt may be reduced or omitted. A small quantity of salt is beneficial, but poultry of all kinds may be poisoned by eating too much salt. Salt in excessive quantities is an irritant poison to poultry, and death usually follows too quickly for treatment to be administered. If they can have timely access to water the effect is often less harmful.

**Grains and Meals.**—Naturally we all wish to feed our birds as inexpensively as possible, provided it results in the maximum of eggs. Good, plain, wholesome food is all that is required, and this can be grown in Rhodesia by poultry farmers. The best quality grains and meals make the most economical and efficient rations. Grains that are light in weight indicate a large proportion of husk, and such grains are unwholesome poultry foods, and on account of the excess of husk or fibre they are little better than dry grass. Immature, shrivelled grains do not contain the full amount of digestible matter, and these grains are sure to be deficient

in nourishment. To obtain the best results nothing but plump, sound, well-matured grains and their products should be chosen.

It should be remembered that fowls are omnivorous; they require grain and its by-products, green food and animal food. Wheat, munga, mealies, monkey nuts and sunflower seeds are some of the best Rhodesian-grown grains to feed to poultry. Wheat and munga can be fed better alone than can maize; the latter is more fattening. Monkey nuts and sunflower seeds are palatable and should be included in the ration. There are other locally grown grains, such as beans and buckwheat, which poultry will eat freely and which may generally be used with advantage. A scratch mixture, consisting of whole or cracked grains made of a combination of two, three or more of those mentioned, can be fed to advantage. It is not advisable to feed continuously any single grain, especially mealies and kaffir corn, owing to their fattening properties already mentioned.

A mash of the above grains ground into meal and animal food should be fed usually, in addition to the scratch mixture. Wheat, bran, pollard, monkey nut meal and meat meal form the basis of a good mash. Just as good results can be obtained from a simple mash containing three or four ground grains and animal food as from a mash containing six or eight products. The fewer the meals used in the composition of a mash, the more necessary it is to see that those meals are of good quality. Suppose the mash is composed of six or seven different foodstuffs, one poor sample will probably not make so much difference; but if the mash is to be composed of, say, only three kinds of foodstuffs, then one poor sample makes a vast difference and may easily spoil the lot. As a general rule a simple feed mixture, composed of home-grown grains and their by-products, supplemented by sweet or sour milk or some animal food rich in protein, will prove most profitable and will produce eggs at the lowest cost. Only sound grains and meals in good condition and quality should be fed to poultry, and damp, musty or mouldy grains should never be used. Bran or pollard should be the basis of the soft food, which can be given either moist or in the dry state in hoppers. Crushed mealies or sunflower seed should be the basis of the grain mixture,

which should be scattered in the litter and the birds made to scratch for it.

*Approximate Quantity of Food Required by One Hen for One Year.*

| | |
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| Grain and all meals ... ... ... ... | 85 lbs. |
| Oyster shell ... ... ... ... ... ... | 4 lbs. |
| Grit ... ... ... ... ... ... ... ... ... | 2½ lbs. |
| Charcoal ... ... ... ... ... ... ... | 2½ lbs. |
| Bone meal ... ... ... ... ... ... ... | 2 lbs. |
| Green food or leaf meals ... ... | 9 lbs. |
| Salt ... ... ... ... ... ... ... ... ... | 6 ozs. |

**Animal Food.**—Meat in some form or other the birds *must* have, either in the form of meat meal, fish meal, whale meal or blood meal, at the rate of 5 to 12 per cent. of the mash mixture, depending upon the quality and whether the hens are laying or not. The quality of these must be good. Thick separated milk or butter milk is excellent for replacing part of the animal food. The milk may be used in mixing the mash if a moist mash is fed, or it can be kept before the birds as a drink. If the thick curd is given to growing stock they may eat enough of it to replace all the animal food needed. Green cut bone, if fresh and sweet, will also take the place of meat meal if fed at the rate of one-third to one-half ounce daily per hen. If too much is fed it will act as a laxative.

**Green Food.**—This is the most important part of the diet, and applies particularly to birds kept in confinement and during the winter, especially so in this hot climate. Without it or if not given in sufficient quantity the birds cannot be expected to produce a good supply of eggs, nor, in fact, will they continue to be healthy. Lucerne, sunflower leaves, buckwheat and monkey nut leaves and tops dried are of about equal value as green food. Cabbage, kale and rape are all easily grown and are excellent in moderate quantities; if given in excess alone they are liable to taint and even discolour the eggs. Mangolds, swedes, pumpkins and kaffir melons are excellent in dry weather or when succulent green foods are scarce. Lucerne and sunflower leaves may be dried and converted into leaf meal with advantage, which can be stored for several months and fed to the birds in conjunction

with the dry or moist mash. Dry leaf meals can be given as a substitute for green vegetation, especially when fed to mature stock. Other excellent green foods are green barley, onion tops, Swiss chard, sugar beet, willow leaves, edible canna, plumbago, kikuyu, belhambra and msasa leaves and sprouted oats, barley and wheat. Grain for sprouting is soaked overnight in water and then spread out one-quarter to one-half inch thick in trays with perforated bottom and placed in a stand for this purpose, or half paraffin tins perforated may be used. Another excellent method is to take a shallow box with three or four inches of soil, in which the seeds may be planted and watered. When the shoots appear over the level of the box, small mesh wire netting may be placed over the top and the box put into the runs for the fowls to help themselves to the shoots as they appear through the wire netting top. The plants continue to grow and shoot out if watered, and may last for several days.

**Methods of Feeding.**—Hens and pullets will do better when they are kept in separate flocks and fed by different methods. Pullets require to be fed on more fattening foods than do hens, and there is less tendency for them to become fat. The mash ration for hens should contain very little or no mealie meal to prevent them from getting too fat. Although the ration for hens should be of a less fattening nature, they prefer fat-forming foods and will always select this kind in a mixed ration, to the exclusion of the more nitrogenous grains. If hens and pullets are kept together and fed as one flock they cannot be controlled, and the hens are apt to get more fattening foods than they need and the pullets may be affected by a lack of it, in consequence of which the best results cannot be obtained by this system of feeding and housing young and old stock together. Hens that are a year old or more should be fed on a nitrogenous mash by eliminating the mealie meal; this is likely to cause them to consume less mash and stimulate their appetite for the grain food, which if scattered in deep litter will induce them to indulge in more exercise, followed by a hard, lean condition. This method of feeding is particularly desirable in the case of the heavy breeds, as they tend to become lazy and over-fat.

In the event of this method of feeding and the additional exercise being not sufficient to promote satisfactory egg production or prevent the birds from putting on surplus fat, a reduction in the grain allowance will increase the consumption of mash, thereby increasing the proportion of protein consumed and should stimulate their activity, appetite and production. Pullets that lay very heavily tend to exhaust their physical capacity and will invariably lose weight. The normal maximum production must be recognised by the attendant or by examining the birds on the roosts from time to time, and the feeding regulated accordingly. If the pullets are losing weight because of heavy production, either more grain should be given or an increased percentage of mealie meal incorporated in the mash. This will cause the birds to gain weight and regain their powers of resistance and production. It will therefore be observed that a cessation in egg production may frequently be caused by one of two factors in a well-fed flock of birds: (1) lowered condition among pullets, caused by too much nitrogenous foods and forced egg production; (2) a wide or fattening ration, which results in hens becoming lazy and too fat, followed by decreased egg production.

The unseasonal or what is known as the "pullet moult" is often a natural reaction against forced egg production. Whilst the success with hens depends to a considerable extent upon the judgment of the attendant and the method of feeding, a good practice when the birds are coming through the moult and during the winter months is to induce the hens to exercise by scratching in litter as soon as they leave the roosts in the morning. This can be done by either leaving some grain in the litter overnight for the birds to clean up at dawn, or an early morning feed of grain may be given. The morning feed should be one-quarter or one-half the daily grain allowance and the mash hopper closed. As a general rule laying birds should be made to consume a relatively larger proportion of grain in the winter months than during the hottest period of the year. Early hatched pullets that tend to premature laying should be fed on more grain than mash. This will be less stimulating and more fattening. The percentage of grain food may be reduced gradually to equal proportions of grain and mash as the pullets are required to commence laying.

A practice that leads to lowered production and unseasonal moulting on many farms is the general reduction of the quantity of food supplied to the laying flocks because they may get too fat. This is a fallacy which is most obstinately held. The idea becomes epidemic, especially among beginners, at certain seasons of the year, and many who should know better also become more or less afflicted by it. Several cases have been observed where egg production had almost ceased, even in the plentiful season, through reducing the food allowance of the hens to a minimum in most cases, imagining that the hens are becoming over-fat. An over-fat condition of mature young birds should be sought either in respect to the method of feeding or the composition of the menus. It is essential to supply a sufficient quantity of a well-balanced ration.

**Change of Ration.**—It cannot be too strongly emphasised that when it is necessary to change the ingredients of a ration for birds in lay, the change should be made gradually; for example, if monkey nut meal is to be replaced by bean meal, a small percentage of the monkey nut meal should be removed from the ration daily or weekly and the bean meal increased proportionately. Any abrupt change in the ration will disarrange the system of the birds and cause them to cease laying and perhaps moult. If the feeding or management of poultry is inconsistent, the laying will be inconsistent as a rule. A regular system of management of some kind must be followed. Regularity is important. Fowls will adapt themselves to any system of feeding and management, provided it is accompanied by regularity. A method of feeding may be adopted when dry meals alone are given or by one in which the mash is given in moist form. A system may be practised also which contains both of these methods. The dry method of feeding is more closely associated with the natural feeding of birds, and it is usually more convenient.

The scratch mixture or grain may be fed twice daily during the winter months, preferably in litter 6 to 10 inches deep on the floor of the house. In the morning give the fowls sufficient to encourage exercise, and at night always give enough to fully satisfy them. Munga is one of the best scratch grains to feed in the early morning, for, being palatable and small, they will work hard to find it. During

the hot summer months the munga may be mixed with the grain mixture and fed once a day in the afternoon under ordinary conditions. Feed a mash either as a dry or moist feed, in addition to the scratch grains. The dry mash is the more common method in vogue and is preferable. This should be kept in the hoppers before the birds constantly or during part of the day. A moist (not sloppy) mash gives satisfactory results when used by a careful feeder. A moist mash is very useful to use up table scraps, and is greatly improved if mixed with milk. A light feed of moist mash sometimes may be fed to advantage to supplement the dry mash for pullets if they do not eat the mash freely when coming on to lay. Moist mash is the recognised feed for ailing birds and fattening table poultry, to which can be incorporated waste table scraps. According to experiments, the dry mash system generally gives better results on a large scale than moist mash, and is a labour-saving method.

If the hens show a tendency to become too fat it is sometimes necessary to close the mash hoppers at noon and make them work longer for the grain mixture in the litter. Feed the same rations or combinations of feed throughout the year if possible, or with only slight variations, and do not try to force egg production in pullets or the breeding stock by special methods of feeding or by abnormal rations.

**Quantity of Grain to Feed.**—The poultry farmer must use his own judgment in deciding how much grain to give the hens, as the amount of food they will eat varies with different pens and at different seasons of the year. They will eat more food when laying heavily than when laying fewer eggs. A fair general average is to feed a pint measure of scratch grains and one pint of mash daily to six hens if moist mash is given in addition to the green food. When the birds require less food the average should be one pint measure to eight or ten birds, as necessary. The birds should go to roost with a full crop; this applies particularly during the winter months, when the nights are long.

**Menu.**—There are many grains and meals obtainable in Rhodesia which are suitable for feeding poultry, and a good combination may be made up to suit the poultry farmer from the grains at his disposal. The value of the rations

is largely dependent on the quantities of protein and carbohydrates present, without special regard to what particular food is their source. Due consideration should, however, be given to palatability, digestibility and fibre content of the food. It is advisable to choose from the grains that are most easily obtained. Wheat and oats are generally too expensive in Rhodesia, but crushed mealies, munga, sunflower seed, bran and pollard can be obtained in most localities. Whether commercially mixed or home mixed foods are to be used is a matter of convenience and common sense, and this must be left to the poultry farmer to decide. It has been emphasised that there is no one best ration. Any menu which supplies the proper quantity and proportions of nutrients as economically as possible is a good ration.

Owing to the difficulty of obtaining in Rhodesia suitable nitrogenous grains, it becomes essential—indeed, there is no alternative but to confine the rations to local grown grains and their by-products. Fortunately bran and pollard, the by-products of wheat, are obtainable. The accompanying rations have been compiled to the best advantage from suitable grains for poultry which are at our disposal, and with an endeavour to provide a selection to meet the needs of poultry farmers in various parts of the country. The meal and grain rations as given are suitably coupled together, but they may be interchanged to meet requirements. In all cases the following mash and grain rations are not separately balanced. The mash rations contain an excess of protein; this is termed a "narrow ration," and can be more safely fed to growing stock and laying hens kept in close confinement. The grain rations contain more fat-forming material than is required for egg production, but the combination of any two of these mash and grain menus forms a balanced ration for egg-producing purposes. The method of feeding and the condition of the birds require attention. Laying hens are creatures of habit, and if irregularly attended to they become restless and discontented and will endeavour to escape from the wired-in runs. If over-fed they become fat and lazy, and if their food is insufficient they will not remain healthy or productive. A knowledge of the proper method of feeding and whether the birds are satisfied and in good laying condition must be acquired by observation.

These menus may be regarded as satisfactory and will serve as a guide for general use.

| A. *Mash.* | | A. *Grain.* | |
|---|---|---|---|
| Bran ... ... ... ... ... | 100 lbs. | Crushed mealies ... | 100 lbs. |
| Pollard ... ... ... | 100 ,, | Munga ... ... ... ... | 50 ,, |
| Mealie meal ... ... | 25 ,, | Sunflower seed ... | 25 ,, |
| Meat meal ... ... ... | 20 ,, | | |

| B. *Mash.* | | B. *Grain.* | |
|---|---|---|---|
| Bran ... ... ... ... ... | 100 lbs. | Crushed mealies ... | 100 lbs. |
| Pollard ... ... ... | 50 ,, | Kaffir corn (white) ... ... ... | 50 ,, |
| Monkey nut meal (not extracted) | 50 ,, | Crushed beans ... | 50 ,, |
| Meat meal ... ... ... | 30 ,, | Sunflower seed ... | 30 ,, |
| Mealie meal ... ... | 50 ,, | | |

| C. *Mash.* | | C. *Grain.* | |
|---|---|---|---|
| Bran ... ... ... ... ... | 100 lbs. | Crushed mealies ... | 150 lbs. |
| Pollard ... ... ... | 50 ,, | Buckwheat ... ... | 50 ,, |
| Bean meal (velvet, soya, cowpea, kaffir bean) ... | 50 ,, | Munga ... ... ... ... | 100 ,, |
| Meat meal ... ... ... | 30 ,, | Monkey nuts ... ... | 50 ,, |
| Mealie meal ... ... | 50 ,, | Sunflower seed ... | 50 ,, |

| D. *Mash.* | | D. *Grain.* | |
|---|---|---|---|
| Bran ... ... ... ... | 100 lbs. | Crushed mealies ... | 100 lbs. |
| Pollard ... ... ... | 100 ,, | Beans ... ... ... ... | 25 ,, |
| Mealie meal ... ... | 50 ,, | Sunflower seed ... | 30 ,, |
| Meat meal ... ... | 25 ,, | | |

# Price List of Forest-Tree Transplants, Ornamental Trees and Shrubs, Hedge Plants, Creepers and Seeds,

OBTAINABLE AT THE GOVERNMENT FOREST NURSERIES.

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1. Transplants of forest trees, etc., as far as in stock, are obtainable at the subjoined rates.

2. Orders should be addressed to the Forest Officer, Department of Agriculture, Salisbury; or Manager, Forest Nursery, Salisbury; or Manager, Mtao Forest Reserve, P.B. Umvuma.

3. **All orders must be accompanied by a remittance in cash, bank note, postal order, draft or cheque, made payable to the Department of Agriculture, Salisbury. Under no circumstances will plants or seeds be sent out or taken away from the Nurseries unless paid for.**

4. All transplants are despatched at Rate 10 on railways at purchaser's risk. The transplants are watered as far as this is possible by the railway staff.

5. All prices quoted are for delivery free at any station or siding in Southern Rhodesia.

6. Purchasers of trees contained in tins either of 25 or 4 trees are requested to return the tins, carriage forward, to the nursery from which they were obtained, either Manager, Forest Nursery, Salisbury; or Manager, Mtao Forest Reserve, Fairfield Siding. If the tins are not returned within two months from date of issue, they will be charged for at the current rate of petrol tins; present price, 4d. each.

7. No trees will be reserved unless specially booked. Orders will be executed in order of receipt as trees are ready for despatch. Every effort will be made to comply with instructions of purchasers.

8. Transplants of forest trees, when quoted at per 1,000, are grown in half paraffin or petrol tins containing 20 to 25

transplants. The average weight of each tin is about 25 lbs. Height of transplants, about 3 to 12 inches.

9. Transplants of larger size, from 1 ft. to 3 ft., are also supplied four in a tin at per tree. Weight of tin, about 25 lbs.

10. Shrubs and ornamental plants in single tins have a weight of about 5 lbs.

11. To purchasers of forest trees, the following reductions are made:—

(a) When the number exceeds 1,000, the price is £3 5s. per 1,000.

(b) When the number exceeds 5,000, the price is £2 14s. per 1,000.

12. Orders for seed are posted or railed free of charge.

13. Though every care is taken to supply trees and seeds true to name and of good quality, no guarantee can be given in this respect, more particularly in regard to seed.

14. Intending tree planters are invited to apply to the Forest Officer, Department of Agriculture, Salisbury, for advice as to the most suitable trees for growing in the various climates and soils of the Colony, and on the best methods to adopt in the formation of plantations, wind breaks and shelter belts.

15. From time to time a list of plants ready for delivery is published in the *Rhodesia Agricultural Journal*. This list may be had on application to the Department.

16. No responsibility taken after trees, shrubs, etc., have been accepted by the Railways. Any claim for loss or death should be made to the Railway Company.

**Price of Transplants.**—For convenience, the following symbols are used to indicate the purchase prices of transplants:—

A—Trees, 25 in tin, at 2s. 3d. per tin, £3 5s. per 1,000; £2 14s. per 1,000 for orders over 5,000.

B—Trees and shrubs, 24 in tin, at 3d. each.

C—Trees and shrubs, 4 in tin, at 4d. each.

D—Trees and shrubs, 4 in tin, at 9d. each.

E—Trees and shrubs at 9d. each; extra large up to 5s. each.

| Botanical name. | Common name. | Remarks. | Price of transplants. | Price of seed. Lb. | Price of seed. Oz. |
|---|---|---|---|---|---|
| Callitris calcarata ... | Black cypress pine ... | Usually rather slow growing, but reaches a fair size and produces a valuable durable softwood. Suited for dry country planting, especially in sandy soil. Resistant to white ants. Good shelter for orchards, etc. | A. C. | 15s. | 1s. |
| Callitris robusta ... | White cypress pine ... | Similar to Callitris calcarata. Better for poor acid soils and ironstone kopjes. | A. C. | 15s. | 1s. |
| Casuarina Cunninghamiana | Beefwood ... ... | A fine large shade tree, suitable for avenues and narrow belts, but not recommended for timber plantations. Requires deep soil in drier localities. The foliage is useful for stock fodder, and the tree stands lopping well. | A. C. | ... | 2s. pkt. 1s. |
| Cedrela toona ... | Toona tree ... ... | A rapid-growing, handsome, semi-deciduous tree, suited for moister localities where frost is slight. Yields a valuable soft timber. Recommended for plantations, as well as shade and ornament. | A. C. | 15s. | 1s. |
| Cupressus arizonica ... | Arizona cypress ... | A hardy evergreen tree, suitable for dry localities, but requiring a well-drained and rather deep soil. Useful for shelter belts and also for hedges when closely planted. | A. C. | 15s. | 1s. |
| Cupressus lusitanica ... | Portuguese cypress | A fast-growing cypress, producing an excellent softwood timber, but requires a moist, cool climate and a good soil. May well be used for shelter and hedges in favourable localities. | A. C. | 5s. | 6d. |
| Cupressus sempervirens, var. horizontalis | Common spreading cypress | A hardy cypress, suited for limestone as well as other soils. Not so frost or drought hardy as Cupressus arizonica. Suitable for shelter and hedges. | A. C. | 15s. | 1s. |

| Botanical name. | Common name. | Remarks. | Price of trans-plants. | Price of seed. | |
|---|---|---|---|---|---|
| | | | | Lb. | Oz. |
| Cupressus sempervirens, var. pyramidalis | Common upright cypress | An ornamental tree for gardens and cemeteries. Also useful as a shelter tree. Grows under similar conditions to the "var. horizontalis." | A. C. | 15s. | 1s. |
| Cupressus torulosa ... | Himalayan cypress ... | A good tree for timber and shelter. Withstands much cold and drought. Not very soil exacting. Fairly frost-hardy. | A. C. | 10s. | 9d. |
| Eucalyptus botryoides | Bangalay ... ... | A large-leaved, heavy-foliaged gum. Quick growing. Suitable for granite and red soils. Withstands frosts, but not very drought-resistant. | A. | 15s. | 1s. |
| Eucalyptus citriodora | Lemon-scented gum ... | A clean-boled tree, producing an excellent timber. Leaves lemon-scented. Suited for wetter regions and on the better soils in the lower rainfall regions. Will not withstand much frost or drought. Flowers prolifically, rendering it very useful for honey production. | A. | 15s. | 1s. |
| Eucalyptus crebra ... | Narrow-leaved ironbark | A slow-growing, deep-rooting species, producing excellent timber. Suitable for well-drained soils in the higher rainfall areas. Withstands a certain amount of drought and light frosts. Will not thrive in an acid soil. | A. | 15s. | 1s. |
| Eucalyptus globulus ... | Tasmanian blue gum ... | A fast-growing tree, suitable for cool, moist areas with deep soils. Will not withstand drought, but is frost-resistant to a large extent. Produces a useful timber. | A. | 15s. | 1s. |
| Eucalyptus maculata ... | Spotted gum ... | One of the best trees for timber production or shelter in the wetter areas, being fairly hardy to drought but not to frost. Produces an excellent timber. | A. | 15s. | 1s. |

| | | | | | |
|---|---|---|---|---|---|
| **Eucalyptus maideni** ... | Maidens' gum ... | A very fast-growing, large tree, with bluish foliage in youth. Fairly drought and frost resistant. Will grow on poor soils if deep and well-drained. Produces a good, strong, useful timber. | A. | 30s. | 2s. |
| **Eucalyptus melliodora** | Yellow box ... | ... A medium-sized tree, useful for shelter belts. Produces a tough, durable timber. Very resistant to drought and frost. Valuable for honey production, having abundant sweet flowers. | A. | 15s. | 1s. |
| **Eucalyptus paniculata** | Grey ironbark | ... A very good timber tree, with heavy foliage. Suitable for the moister regions, with a deep, fertile soil. Withstands some drought, but is frost-tender. Yields an excellent, hard, durable wood. | A. | 15s. | 1s. |
| **Eucalyptus pilularis** ... | Blackbutt ... | ... A large, rapid-growing tree, producing a strong, durable timber. Thrives only in moist localities. Somewhat frost-tender. | A. | 15s. | 1s. |
| **Eucalyptus punctata** ... | Leather jacket | ... A tree of fair size, yielding a good, durable timber. Adaptable as regards soil and climate, but will not withstand a dry, cold climate. | A. | 15s. | 1s. |
| **Eucalyptus resinifera** | Red mahogany | ... A very good timber tree in moist regions with deep soils. Will not flourish where frosts are severe. Grows very rapidly during the first five or six years, then tends to slow down. Good for poles and quickly-established shelter belts. | A. | 15s. | 1s. |
| **Eucalyptus robusta** ... | Swamp mahogany | .. A quick-growing, shady tree, which requires a moist soil for best results, but will grow under fairly dry conditions, provided frost is not severe. Recommended rather for shelter belts than plantations. | A. | 15s. | 1s. |
| **Eucalyptus rostrata** ... | Red gum ... | ... Produces an excellent and durable hardwood. Withstands drought, heat, brak, flooding and a good deal of frost. One of the best species for planting in Southern Rhodesia, except in sour soil and wet mountain regions. | A. | 15s. | 1s. |

| Botanical name. | Common name. | Remarks. | Price of transplants. | Price of seed. Lb. | Price of seed. Oz. |
|---|---|---|---|---|---|
| Eucalyptus saligna ... | Sydney blue gum .. | A fast-growing, useful tree, producing a useful medium hardwood. Thrives on deep, fertile soils in the heavier rainfall areas. Tender to frost and drought. | A. | 15s. | 1s. |
| Eucalyptus sideroxylon | Red ironbark ... | A fairly slow-growing species, suitable for dry, rocky soils in the moister regions. Produces a good, durable hardwood. | A. | 15s. | 1s. |
| Eucalyptus tereticornis | Forest red gum . . | Similar to Eucalyptus rostrata, and can be planted along with it, except in areas liable to flooding and great heat. Perhaps not quite as drought-resistant. | A. | 15s. | 1s. |
| Grevillea robusta ... | Silky oak ... ... | A handsome tree which thrives best in moist, warm localities. Useful for ornament, shade and timber. Frost-tender and not resistant to drought. If the locality is unsuitable, it may grow well for several years and then die out. | A. C. | ... | pkt. 1s. |
| Jacaranda mimosaefolia | Jacaranda ... ... | An ornamental tree with feathery foliage and abundant blue flowers, which appear in spring. Best development is attained in the moister regions, but the tree withstands drought to a surprising extent, and may be planted in the drier regions if the soil is reasonably deep and fertile. It is tender to cold and frost, and may need protection in its earlier youth. Semi-deciduous. | A. C. | 20s. | 1s. 3d.<br>pkt. 1s. |
| Pinus canariensis ... | Canary Island pine ... | Hardy to drought, but not to severe frost. Best suited for planting on higher altitudes and in higher rainfall areas. Slow growth in early youth, then more rapid in later years. A handsome tree with inverted, umbrella-like branches, not spreading. Yields an excellent softwood timber. | A. C. | 15s. | 1s. |

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|---|---|---|---|---|---|
| **Pinus halepensis** .. | Aleppo pine ... | ... A drought-resistant pine which will grow on limestone and shale soils. Not recommended for plantations, but can be used for shelter and ornamental purposes in the drier regions. | A. C. | 15s. | 1s. |
| **Pinus insignis** ... | Remarkable pine | ... A large tree of very rapid growth, producing a useful softwood. Most at home in the heavier rainfall areas. Does not like sour or poorly-drained soils. Frost-hardy, but not drought-resistant, usually failing at an early age in the drier regions. | A. C. | 15s. | 1s. |
| **Pinus longifolia** ... | Chir pine ... | ... A somewhat slow-growing pine, but useful to plant in localities where the climate and soil are doubtful at the higher elevations. For timber and ornamental purposes. Not frost-resistant or very drought-hardy. | A. C. | 15s. | 1s. |
| **Pinus pinaster** ... | Cluster pine | ... Yields a useful, strong softwood. Does well on sandy soils and soils without much lime, in the better rainfall areas. Not very drought-resistant. | A. C. | 15s. | 1s. |
| **Populus alba** ... | White poplar | ... A rapid-growing poplar, requiring a good, deep soil in close proximity to running water. Propagated by suckers. Deciduous. | Suckers at 3d. each. | | |
| **Populus deltoidea**, var. **missouriensis** | Carolina poplar | ... A very fast-growing poplar, producing a very good timber for matches, etc. Requires a rich, moist, alluvial soil. Moderately frost-hardy. Does not like stagnant water. | D. | | |
| **Salix babylonica** ... | Weeping willow | ... A useful timber and ornamental tree, requiring a moist, well-drained soil which is occasionally flooded. Not suited for ground in which water is stagnant. | C. | | |

## Ornamental Trees, Shrubs and Hedge Plants.

| Botanical name. | Common name. | Remarks. | Price of trans-plants. | Price of seed. Lb. | Price of seed. Oz. |
|---|---|---|---|---|---|
| Aberia caffra ... | Kei apple ... | ... A rough, thorny, impenetrable shrub, making a good hedge. Withstands frost and drought well. Suited for all but the driest areas of the Colony. More useful than ornamental. | B. E. | | |
| Abutilon chinensis ... | Chinese lantern | ... An ornamental shrub, with orange-coloured flowers, requiring a heavy pruning about the fourth year. | E. | | |
| Abutilon Thompsonii | Chinese lantern | ... Similar to the above, but has variegated leaves. | E. | | |
| Acacia Baileyana ... | Silver wattle | .. A small ornamental tree with blue foliage and yellow flowers. | E. | | |
| Agapanthus umbelatus | Cape lily . | ... Blue and white varieties. | E. | | |
| Aloysia citriodora ... | Lemon-scented verbena | A small shrub with a strongly lemon-scented foliage. Hardy, vigorous, quick-growing. | E. | | |
| Bauhinia galpini ... | Pride of de Kaap | ... A rambling shrub, bearing orange-red flowers. | D. E. | | pkt. 1s. |
| Bauhinia acuminata ... | Bauhinia .. | ... A large indigenous shrub, flowering profusely in early spring. White flowers. | D. E. | | pkt. 1s. |
| Bauhinia purpurea ... | Bauhinia ... | ... Similar to the Bauhinia acuminata, but with mauve flowers. | D. E. | | pkt. 1s. |
| Bolusanthus speciosus | Rhodesian tree wisteria | An indigenous, deciduous tree with blue flowers at the end of long stalks. Ornamental. | E | | |
| Brugmansia Knightii | Moonflower ... | ... A flowering shrub with large, drooping, white flowers. Strong scent (cf. lily). Fairly frost-hardy. | E. | | |
| Buddleia ... ... | Blue buddleia | ... A medium-sized shrub with sweet-scented blue flowers. Useful as a hedge. Rapid-growing, but frost-tender. | E. | | |

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| **Buddleia** ... ... | Yellow buddleia ... | ... A rank-growing, yellow-flowering shrub. Useful as a hedge. Rapid-growing. Frost-tender. | E. | |
| **Callistemon speciosus** | Bottlebrush ... | ... A scarlet-flowering shrub of drooping habit. Makes an excellent hedge if trimmed along the top only. | A.C.E. | ... 2s. pkt. 1s. |
| **Carica papaya** ... | Pawpaw ... | ... A small tree with a large, dark green foliage, bearing large edible fruits. | E. | |
| **Cassia capensis** ... | Cape laburnum | ... A rapid-growing shrub, bearing masses of bright yellow flowers. | E. | |
| **Cestrum auranticum** ... | Ink berry ... | ... A small shrub, bearing orange flowers in profusion. | E. | |
| **Cinnamomum camphora** | Camphor ... | ... A somewhat slow-growing, ornamental, evergreen tree, with camphor-scented foliage. It requires a deep soil in the higher rainfall zones. | D. | |
| **Croton sylvaticus** ... | Mount Selinda linden | A large-leaved, deciduous tree from Melsetter. | E. | |
| **Dahlia imperialis** ... | Tree dahlia ... | ... A medium-sized shrub, making a handsome show with its single white blooms. | E. | pkt. 1s. |
| **Dalbergia sissoo** ... | Sissoo ... | ... A large deciduous tree from India, producing an excellent timber. Desires a deep, porous, well-drained soil in close proximity to running water. Will not tolerate stiff clay. Frost-hardy, but not very drought-resistant. Rapid-growing. | D. | |
| **Deutzia crenata** ... | Bridal wreath | ... A small deciduous shrub with double white flowers, tinged slightly pink, on long, drooping stalks. | E. | |
| **Duranta plumieri** ... | Tree forget-me-not | ... A medium-sized, deciduous shrub with blue flowers. Useful as a hedge. Very hardy. | E. | |
| **Eugenia braziliensis** ... | Brazilian cherry | ... A small shrub, bearing orange-coloured, edible fruits. A useful hedge plant. | D. | |

| Botanical name. | Common name. | Remarks. | Price of trans-plants. | Price of seed. Lb. | Price of seed. Oz. |
|---|---|---|---|---|---|
| Euphorbia splendens ... | Christ thorn | ... A small thorny shrub with bright scarlet flowers. Suitable for low hedges and borders. | E. | | |
| Freylina tropica ... | Inyanga hedge plant | ... A useful hedge shrub. Indigenous. | B. | | |
| Gardenia florida ... | Katjepeering | ... A compact, evergreen shrub with dark green, glossy leaves and pure white, sweetly-scented double flowers. | E. | | |
| Heliotropium peruvianum | Heliotrope ... | ... A small shrub with sweet-scented lilac or nearly white flowers. | E. | | |
| Hibiscus sinensis ... | Chinese rose | ... Evergreen shrub with numerous scarlet flowers. Double and single varieties. | E. | | |
| Hibiscus syriacus ... | Christmas rose | ... A shrub of which there are single and double varieties with white flowers. | E. | | |
| Holmskioldia sanguinea | Holmskioldia | ... A fairly hardy shrub, bearing a profusion of brick-red flowers in large bunches. Suitable for hedges. | E. | | |
| Holmskioldia sp. ... | Holmskioldia | ... A yellow-flowering, handsome shrub similar to Holmskioldia sanguinea. | E. | | |
| Hypericum lanceolatum | St. John's wart | ... A small, yellow-flowering shrub. Multitudes of flowers. | E. | | |
| Iochroma tubulosa ... | Iochroma ... | ... A shrub with dark blue flowers. | E. | | |
| Iochroma ... ... | Iochroma ... | ... A shrub with scarlet flowers. | E. | | |
| Lagerstroemia indica ... | Pride of India | ... A large ornamental shrub, with mauve and pink flowering varieties. Handsome and hardy. | E. | | |
| Ligustrum lucidum ... | Chinese privet | ... An excellent hedge plant or ornamental shrub. Can be clipped into shape. Liable to die off in patches or lose its lower leaves unless planted in moist soil of fair depth. Propagated from cuttings. | A. | | |

| | | | | | |
|---|---|---|---|---|---|
| **Melia azedarach** | Syringa | A deciduous tree, producing a good light timber. Shallow rooting. Withstands drought well. Has fine lilac flowers and persistent yellow berries. Suitable for better rainfall areas and deep sandy soil, but will grow under severe conditions. | E. | | |
| **Moschosma** | Rhodesian spirea | A medium-sized, blue-flowering shrub. | E. | | |
| **Pereskea aculeata** | Barbadoes gooseberry | A shrub which tends to climb. With recurved thorns. Produces fleshy leaves. | D. | | |
| **Persea gratissima** | Avocada pear | A shrub with an edible fruit. | | 3s. each | |
| **Photonia japonica** | Loquat | A small evergreen tree with large leaves, bearing yellow edible fruit. | D. E. | | |
| **Phytolaca dioca** | Belhambra | A rapid-growing, deciduous tree. Useful for ornament. Timber of no value, but seeds valuable as a poultry or cattle food. | A. | | pkt. 1s. |
| **Pittosporum undulatum** | Camphor laurel | An Australian evergreen shrub, making an excellent hedge, with shining, green, scented leaves and scented berries. | | 12s. 6d. per 100 and C. | |
| **Plumieri rubra** | Frangipani | A handsome shrub with pinkish red flowers. Rather delicate. | | 2s. 6d. each | |
| **Poinciana regia** | Flamboyant | A handsome red flowering, feathery foliaged tree. | D. | | |
| **Poinsettia pulchrimma** | Poinsettia | A shrub with small yellow flowers surrounded by many large, scarlet, leaf-like bracts. Very showy. Double and single varieties. | E. | | |
| **Poinsettia albida** | Poinsettia | As above, but with yellowish white bracts. Double and single varieties. | E. | | |
| **Psidium pomiferum** | Guava | A small, hardy, evergreen tree, bearing edible, yellow fruit. | D. E. | | |

| Botanical name. | Common name. | Remarks. | Price of transplants. | Price of seed. Lb. | Price of seed. Oz. |
|---|---|---|---|---|---|
| Punica granatum ... | Pomegranate | ... A shrub or small tree, having shining leaves, large scarlet flowers and large red fruit. Makes a useful hedge when well cut regularly. | E. | | |
| Rhus lancea ... ... | Karreeboom | ... A small indigenous tree of graceful appearance, yielding a very durable wood. Useful for ornamental purposes. Forms a fine hedge. | A. | 10s, | 9d. |
| Salvia involucra ... | Salvia ... | ... A free-growing shrub with red flowers. Not frost-hardy. | E. | | |
| Spathodea campanulata | African flame tree | ... A handsome, heavy-foliaged tree, bearing bright red flowers. Suited for the heavier rainfall areas on deep soils. | D. | | |
| Streptosolon Jamesonii | Streptosolon | ... A shrub with orange-coloured flowers in dense masses and pale green foliage. Very frost-tender and delicate. | E. | | |
| Tecoma Smithii ... | Tecoma ... | ... An upright, medium-sized shrub with tubular, bright yellow flowers. Forms a useful hedge. Fairly drought-resistant. | A. E. | | pkt. 1s. |
| Thevetia neriifolia ... | Thevetia ... | ... An evergreen shrub, bearing bell-shaped, yellow flowers. Hardy. | E. | | |
| Thuya orientalis ... | Thuya ... | ... A very hardy conifer that withstands heat, cold and drought, and does not mind heavy soils. Slow-growing. Of small size. Very good for hedges. | A. C. | | pkt. 1s. |

Roses from 1s. to 3s. 6d. each.

## Climbers and Creepers

| | | | Plants each. |
|---|---|---|---|
| Aristolochia elegans ... | Dutchman's pipe | ... A rank-growing creeper. Heart-shaped leaves. Purplish crimson flowers, spotted yellow. | 9d. |
| Beaumontia grandiflora | Beaumontia ... | ... A large climber with heavy, glossy foliage. Large white, bell-shaped flowers. Blooms profusely. Fairly frost-tender. | 1s. 3d. |
| Bignonia venusta ... | Golden shower | ... Vigorous creeper. Rapid-growing. Bears masses of orange flowers all the year round. Very useful and hardy. | 1s. 3d. |
| Bignonia speciosa ... | Bignonia ... | ... A rapid-growing, showy creeper, bearing large mauve flowers. Decumbent. | 9d. |
| Bougainvillea splendens | Bougainvillea | ... Vigorous climber. May be also used as a hedge. Bracts magenta. Fairly frost-hardy. | 1s. 3d. |
| Hedera helix ... | Ivy ... ... | ... A dark evergreen climber. Best in shady, cool climates. | 9d. |
| Jasminum sambac ... | Jasmine ... | ... A vigorous, evergreen shrub climber with large trusses of fragrant, white flowers. | 1s. 3d. |
| Jasminum primulinum | Climbing jasmine | ... A yellow-flowering species similar to Jasminum grandiflorum. | 9d. |
| Lonicera periclymenum | Honeysuckle (Woodbine) | Hardy climber with sweet-scented flowers, yellow inside, reddish purple outside. | 9d. |
| Lonicera sempervirens | Red honeysuckle | ... Climber with red flowers. Best kept well pruned or base becomes ugly. | 9d. |
| Mandevilla suaveolens | Mandevilla ... | ... Deciduous climber, bearing trumpet-shaped, white, fragrant flowers. Very slender. | 9d. |

| Botanical name. | Common name. | Remarks. | Plants each. |
|---|---|---|---|
| Passiflora edulis ... | Granadilla ... | ... A quick-growing climber, bearing edible fruits. Subject to woolly aphis if overshaded. A good trellis plant. | 9d. |
| Passiflora coccinea ... | Fiji granadilla | ... A large-leaved climber, bearing yellow fruits. Flowering well. A good trellis plant. | 9d. |
| Podranea Brycei ... | Zimbabwe creeper | ... A rank-growing indigenous creeper with large, pink flowers. | 9d. |
| Rosa bracteata ... | Macartney rose | ... Plant with large green foliage and numerous white single flowers. Useful as a hedge plant. | 1s. |
| Solanum Wenlandii ... | Blue potato creeper | ... A rapid-growing creeper with tubular, blue flowers. Not frost-hardy. | 9d. |
| | | **Palms, Bamboos, etc.** | |
| Livistonia Australis ... | Fan palm ... | ... Fan-shaped palm. Grows to large size. Very ornamental. | 3s. 6d. and 5s. |
| Phoenix reclinata ... | Date palm ... | ... An ornamental palm with a bushy crown. | 2s. 6d. and 3s. 6d. |
| Bambusa arundinaceae | Whipstick bamboo | ... A useful and ornamental bamboo. Fairly hardy. | E. Offsets 2s. 6d. each. |
| Oxytenanthera Abysinnica | Native bamboo | ... A large, useful and ornamental bamboo. Hardy and thriving in higher rainfall zones. | Offsets 2s. 6d. each. |

Offsets of Bamboos supplied during January only.

# Importation of Pedigree Cattle from England.

Arrangements have been made whereby the farmers in this Colony can import pedigree live stock from Great Britain under the scheme existing between the Government of Southern Rhodesia and the Empire Marketing Board, which provides for the payment of the ocean freight and railage from Capetown to destination stations in Southern Rhodesia, and those desirous of participating in the scheme should lodge their applications on a form which can be obtained from the Secretary, Department of Agriculture.

The scheme provides for the importation of registered pedigree bulls, cows, rams and ewes.

It is not proposed to send the Government stock adviser to the United Kingdom, but arrangements will be made whereby the assistance of the staff of the High Commissioner's Office, London, will be available to purchasers to obtain a suitable beast. Those farmers who have already arranged for the purchase of cattle with a breeder or agent in the United Kingdom should furnish on the prescribed form the full name and address of such person, so that the High Commissioner's staff can get into early touch to arrange for the live stock to be forwarded to the quarantine station as soon as accommodation has been arranged.

The purchaser will be without recurrence on the Government, which will act as agent only, the purchaser (or breeder) accepting all risks attendant upon purchase or delivery.

Where the applicant desires the Government to purchase on his behalf, a cheque for 25 per cent. of the estimated purchase price of the animal, plus £30 per head for incidental expenses, must accompany the form of application. In other cases a cheque for £30 per beast to cover incidental charges from the time the animal enters the quarantine station, London, until arrival at destination station should be

attached to the application; all charges to the London quarantine station to be paid by the vendor. No application will be considered unless the amount indicated above is remitted with the order.

Up to the time of delivery to the shipping company the seller normally accepts all risks, including those attendant upon the tuberculin tests in Great Britain.

Thereafter the stock purchased is at the risk of the purchaser, and such risk will apply to all veterinary and/or other tests to which the animals may be subjected in terms of the law or at the request of the owner.

All animals will be insured on behalf of applicants from time of entry into the quarantine station, England, until arrival at station in Southern Rhodesia.

The Government will attend, on behalf of approved applicants, to the payment in the first place of freight, railage, port dues and all other charges in direct transit to destination stations.

If inoculation against redwater or gall-sickness at the Veterinary Research Station, Salisbury, is desired, this will be effected at the buyer's risk and request, subject to the approval of the Director of Veterinary Research. In this connection an animal must conform to the requirements laid down in Bulletin No. 536 of April, 1925, which indicates that—

(1) it should not exceed fifteen months of age when inoculated;
(2) it should not be fat, forced or pampered;
(3) its breeding should not have been such as to have weakened its constitution;
(4) it should be delivered at the inoculation camp in good health and free from ticks;
(5) females should not be pregnant and cannot be treated except under guarantee that they are not in calf.

The incidental expenses which are payable by the importer are estimated at £30. This covers the following expenses in England: Veterinary inspection, inoculation fees, maintenance of the beast at the London quarantine station, port dues, bills of lading and insurance for journey. At

Capetown: Port dues, attendance, off-loading, maintenance in quarantine station and trucking. Only the actual ocean freight and rail charges from Capetown to station of destination are borne by the Government and the Empire Marketing Board.

As all animals exported from Great Britain under this scheme must be shipped prior to the 31st March, 1930, early application to participate in the scheme is essential, and no application received after the 30th November, 1929, can be considered.

C. K. BRAIN,
Acting Secretary,
Department of Agriculture.

Salisbury,
18th October, 1929.

# Seeds for Sale, Gwebi Farm.

| | | s. | d. |
|---|---|---|---|
| Salisbury White Maize, Tips and Butts, per bag of | 200 lbs. | 17 | 0 |
| Kherson Oats | 100 lbs. | 26 | 0 |
| Kinvarra Oats | 100 lbs. | 26 | 0 |
| Ground Nuts (Spanish Bunch in shell) | 75 lbs. | 18 | 3 |
| Boer Manna | per lb. | 0 | 4 |
| Majorda Seed | per lb. | 1 | 1 |
| Sunflower Seed (Large Black) | 100 lbs. | 16 | 0 |
| Sweet Potato Tubers (Calabash Leaf) | 150 lbs. | 11 | 0 |
| Sweet Potato Slips | per bag | 6 | 0 |
| Napier Fodder Roots | per bag | 6 | 0 |
| Edible Canna | per 100 "tubers" | 9 | 0 |

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

# Utilisation of Wood.

By T. L. Wilkinson, M.Sc., B.Sc.F.

**Seasoning of Rhodesian Timbers.**—Recent evidence, brought forward by research into the world's timber resources, has shown that it is essential for a more complete utilisation of wood to take place in order to assist in the conservation of the world's too rapidly dwindling resources.

This can be accomplished in three ways:—

(1) By the correct seasoning of wood and by the utilisation of only well seasoned wood.

(2) By treating wood with some chemical process to increase its durability.

(3) By using more efficient methods of logging, sawmilling and woodworking.

Limited research, which has been possible in the past, has indicated that many Rhodesian timbers considered useless, if correctly handled, have a considerable economic value. In order that a more complete utilisation of the large timber resources of Rhodesia may be effected and the extremely high imports may be considerably reduced, an outline of the best methods of handling native and locally grown timber will be given in a series of articles. In this article it is proposed to deal with the first method.

The seasoning of wood is a primary factor governing more intensive utilisation and conservation of the world's timber supplies. Well seasoned wood is more durable than green wood, and hence less frequent renewals are required, with a consequent saving in demand. The strength of timber is increased when dry, hence there is less liability of breakage, and pieces of smaller dimensions may be used, thus decreasing requirements. Efficient seasoning tends to eliminate defects, prevent decay and insect attack, thereby

causing a considerable saving in utilisation. The primary objects of seasoning other than to effect a more complete utilisation of timber are:—

(1) To improve the timber for its ultimate use and improve its qualities.

(2) To reduce its weight, thus cheapening transport and handling costs.

(3) Together with preservation and increased efficiency in logging, sawmilling and woodworking methods, to make possible the utilisation of timbers not at present in use.

Well seasoned wood will work (warp and shrink) less and take paint, varnish, etc., better than unseasoned wood.

There are numerous methods in vogue to-day for bringing about the seasoning of wood, but before entering into a discussion on them it is desirable to consider briefly what wood really is and what is to be accomplished by seasoning.

Wood, which is the main product of trees, is not a homogeneous material, but is built up of individual "cells" (minute cavities surrounded by walls). These cells are of various types, shapes and sizes, but their general arrangement is similar to that of cells in a honeycomb, though in the former case they are drawn out to a considerable length. The cell cavities when wood is green usually contain a watery fluid, which, when wood dries, evaporates out, leaving air and a small residue in its place. The cell walls are built up of a substance known as "cellulose," which is permeated by a number of substances known as "lignin." The walls of the cells in the green tree are saturated with water, making wood soft and pliable. Seasoning may now be defined as "dehydration," with a minimum of damage to the wood structure.

Seasoning or dehydration is comparatively easy, but the extent of damage incurred during drying determines the ultimate usefulness of wood.

Besides the complicated structure of wood there are numerous factors which influence the seasoning of wood; of these may be mentioned:—

(1) Season of felling.
(2) Dimensions of the timber.
(3) Methods of stacking.
(4) Seasoning period.

There are other factors of importance, such as:—
(a) Species of wood.
(b) Locality in which wood was grown.
(c) Manner in which timber was grown.
(d) Situation of the timber in the tree.
(e) The internal stresses which exist in the timber.

Since the understanding of their influence requires a technical knowledge, a discussion of them has been omitted here.

(1) *Season of Felling.*—This is not of great importance in kiln drying or in localities where the atmospheric conditions are similar throughout the year. It is claimed that it is best to fell when the sap is down, i.e., in the non-growing season. It has been proved, however, that the amount of moisture in trees is more or less constant throughout the year, so that it is only the chemical composition of the sap, which varies according to the season, which may have an effect on the quality of the timber. Winter felling possibly has several advantages over summer felling, in that the temperatures are usually lower, rendering drying less rapid and thus causing less liability to cracking, etc. There is not a very marked advantage in Southern Rhodesia, since often in winter evaporation is excessive, thus limiting the value of "air seasoning." The other reason for winter felling is that timber is less liable to insect and fungi attacks, which are more active in summer. In Southern Rhodesia it may prove best to fell in late summer, prior to evaporation becoming excessive and when insects and fungi are lessening their activities.

(2) *Dimensions of the Timber.*—It is erroneously thought by some that it is best to season timber in the log or in large baulks, and that if sawn they will warp to a greater extent. That this is not the case, except with a very few species, e.g., pines, has from time to time been clearly proven.

Some of the benefits of cutting logs into small dimensions prior to seasoning are:—

(1) Wood dries approximately in proportion to its thickness.

(2) Defects, such as honeycombing, casehardening, are more likely to occur in large logs.

(3) Certain species (especially eucalypts) are more difficult to saw when dry.

(4) In all drying operations mechanical means are required to keep the wood from warping, hence the thinner it is the less the force required to keep the boards or baulks in position.

(3) *Method of Stacking.*—Whatever be the manner of stacking, care must be exercised to ensure against uneven drying and warping. This can best be done by placing the piles on rigid supports running the whole width of the pile, spaced sufficiently close together to prevent the timber sagging. The pile should be so arranged that each piece of wood has free access to the air. Refractory woods should be weighted to prevent warping by laying weights on the top layer of the pile. It should be remembered that most woods will dry straight, and those which will not can be made to do so by mechanical means. It is advisable to place a layer of boards or iron over the stack to prevent it from being too exposed to the sun and weather.

(4) *Period of Seasoning.*—This is far more important in air seasoning than in kiln drying. In air seasoning it is primarily important, due to the uncontrollable climatic factors which govern drying. Air drying, as a general rule, takes from ten to twelve times as long as kiln drying. The ultimate use of wood governs the length of time in seasoning, since wood used for different purposes must be dried to different moisture contents, e.g., joinery wood must be more thoroughly seasoned than rough constructional timber.

Sufficient time should be allowed in seasoning for the moisture content and the stresses set up in drying to become evenly distributed. This can be accelerated and brought about artificially in a very short period in a kiln.

The manner in which wood dries is as yet imperfectly understood, due to the highly complex nature of wood structure.

It is known, however, that it is essential for the transfusion of moisture to take place from the centre to the surface of a piece of wood in an even manner. In order that the difficulties below may not be accentuated, it is also necessary for the rate of surface drying not to exceed the rate of transfusion from the centre to the surface.

Wood contains water in two forms:—

(1) As free water in the cell cavities.

(2) As hygroscopic moisture, saturating and in combination with the cell walls.

The evaporation of free water has little or no effect on the physical or mechanical properties of wood, but the "combined" (hygroscopic) moisture has a great affinity for wood as wood has for it.

It is in the evaporation of this latter type of moisture that all the difficulties in seasoning are met with. When wood dries below its "fibre saturation point" (i.e., the point where all free water has been evaporated, but where the cell walls still remain saturated), shrinkage, casehardening and other defects immediately become apparent.

(5) *Difficulties in Seasoning.*—From a study of the definition of seasoning it would appear that the operation is simple enough, but that it is not so will be seen from a brief description of the main difficulties which arise in carrying out the operation.

A detailed knowledge of these factors is essential if they are to be combated effectively and well seasoned wood is to be produced. The principal difficulties are:—

(1) Casehardening.

(2) Warping.

(3) Uneven shrinkage.

(4) Collapse.

(5) Moisture content and distribution.

(6) Insect and fungi attacks.

(1) *Casehardening.*—This is a very serious difficulty which cannot be observed unless tests are made to determine its presence. Without the use of a kiln it is almost impossible to eliminate it. Casehardening is primarily due to too rapid surface drying. As drying progresses, wood

shrinks, with the result that if surface drying is too rapid the exterior of the wood will shrink more than the interior. When this happens the interior is compressed, and in consequence exerts a pressure on the surface, preventing it from shrinking normally and causing it either to stretch or break. As drying progresses, if the surface layers of wood do not rupture they set in an expanded condition. On further drying the interior tends to shrink normally, until the shrinkage becomes the same as the stretched outside. As it shrinks below this point there becomes a tendency for the interior to compress the surface and for the outside in turn to hold the interior in tension, resulting sometimes in honeycombing (internal splitting).

A board or piece of wood in this condition, although perfectly dry, is unfit for any accurate work, since, if planed more heavily on one side than the other, or deep cut, it is certain to warp. So long as the stresses in a casehardened piece of wood balance one another, it may appear satisfactory, but if the wood is subsequently worked, casehardening being relieved on one side of the wood and not on the other, trouble will always result.

(2) *Warping.*—This is due to casehardening, uneven moisture changes in the wood, the grain of the wood, poor stacking and initial stresses. Twisting and cupping are forms of warping. Some woods are more susceptible to warp than others. Softwoods, as a rule, season easily, as also do some hardwoods, i.e., *Pterocarpus erinaceus* (Mukwa), *Eucalyptus saligna*, etc.; but others, like the heavier Eucalypts, are so addicted to warp that they can only be seasoned successfully in a kiln.

(3) *Shrinkage.*—It is readily evident that shrinkage is an important factor in drying, since unequal shrinkage probably lies at the root of all trouble in handling wood. Due to the structure of wood, it shrinks differently in different directions. Longitudinal shrinkage is negligible, but radial and tangential shrinkages are appreciable in most species. In general it may be stated that wood shrinks tangentially twice as much as radially and one hundred times as much as longitudinally.

(4) *Collapse.*—In some species of wood, e.g., Eucalypts, it may be noticed that in the early stages of drying, a radially

cut surface develops a number of parallel depressions, the whole effect resembling an irregular washboard. This is different to ordinary shrinkage and is quite probably due to the caving in of cell walls when free water is extracted.

(5) *Moisture Content and Distribution.*—The moisture content of green wood varies very considerably, according to the species, locality and manner in which the tree was grown, situation of the wood in the tree, etc. Green wood, however, usually contains 30 to 150 per cent. of moisture.

Wood is never absolutely bone dry, but always contains a certain amount of moisture, depending on the atmospheric conditions in which it is situated. Perfectly seasoned wood in Southern Rhodesia, depending on the locality, should contain from 6 to 12 per cent. moisture. There is always a seasonal variation in the moisture content of wood that can only be overcome by some protective coating; this variation is very small in well seasoned wood and may in such cases be disregarded.

Moisture distribution is of great importance, and may cause considerable trouble in the working of green or partially seasoned wood. Wood, unless well seasoned, usually contains more moisture in the centre than on the surface, hence it follows that if a board is cut (especially deep cut) through the centre, the two exposed surfaces of the new board will have different moisture contents. As the surface with a higher moisture content dries out, shrinkage takes place, and it is obvious that a board shrinking on one side only must move accordingly.

(6) *Insect and Fungi Attacks.*—Since moisture is necessary for the growth of fungi, and since it renders wood more palatable to insects, it will readily be seen that any method of reducing the moisture content of wood will reduce its liability to insect and fungi attack.

Some fungi merely discolour wood, whilst others destroy the wood tissues.

Some insects only attack the fresh sapwood, others the sapwood; whilst others do not discriminate, but attack all wood tissue.

All the above difficulties and factors are responsible for an enormous damage to wood in Rhodesia. They have been

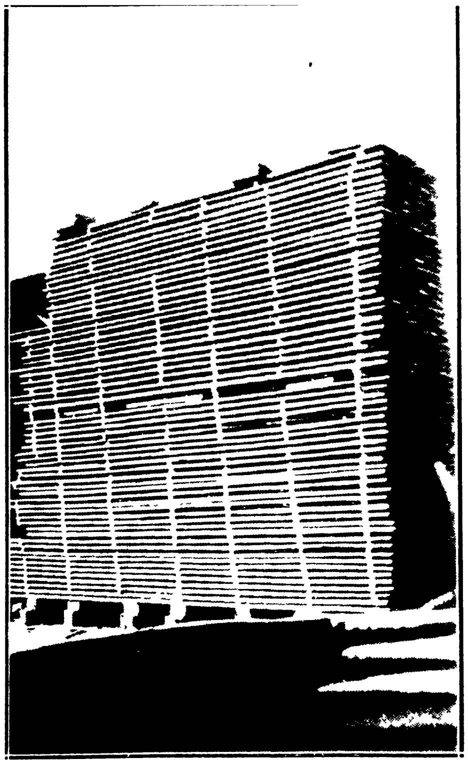

Figure 1. Air seasoning sawn timber.

Figure 2.—Air seasoning round timber.

Figure 3.—Air seasoning half-round timber.

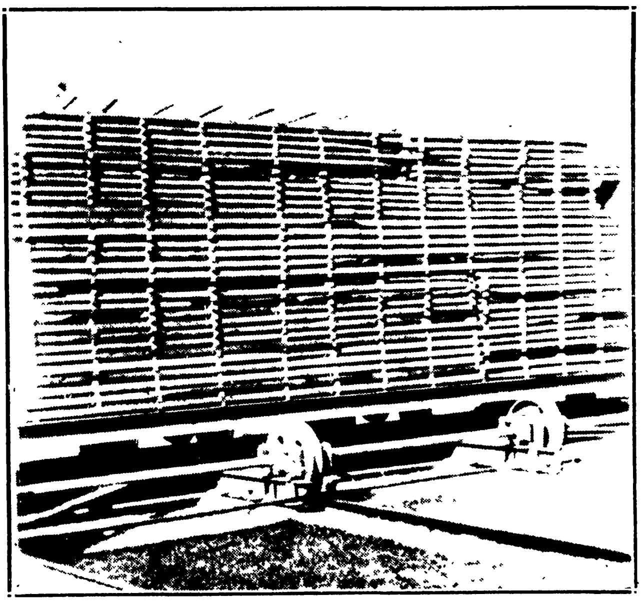

Figure 4.—Load, stacked for kiln seasoning, resting on a traverser to facilitate handling.

combated to a very large extent in other countries through improved seasoning and handling methods, as well as by preservative treatments, and there is no apparent reason why timbers in this country should not respond in a similar manner.

**Methods of Seasoning.**—Though there are numerous methods of seasoning of minor importance in use for special purposes, the methods in general use may be grouped roughly into—

(a) air (or misnamed natural) seasoning under ordinary atmospheric conditions;

(b) kiln seasoning under controlled conditions.

Under certain conditions, e.g., eastern border, and with certain species, e.g., Pines, Cypresses and E. saligna, preliminary air seasoning with final conditioning in a kiln may prove to be the best method.

**Air Seasoning.**—This method consists of the exposure of wood to the drying influences of the atmosphere. Its success is due rather to the slowness with which drying takes place than to the precision with which the factors governing it can be controlled. This method is quite suitable for a number of woods. It has the advantages that the initial outlay on equipment is small and the execution costs are low. There are, however, several disadvantages which deserve consideration in this country; principal among these are the adverse climatic conditions and the length of time necessary to effect complete drying.

This means large storage space and stacking facilities, possible casehardening and attack by fungi and insects, considerable degrade from splits and warp, as well as fire danger. All these factors represent indirect cost of handling, and to them should be added, further, interest on capital tied up in stock and insurance. Also species which do not readily air season will only find a limited market at a reduced price. For any degree of success in air seasoning to be obtained it is necessary to comply with the following rules:—

(1) The site chosen for seasoning should be level, well drained and free from weeds.

(2) The timber should be given sufficient room to permit circulation about each piece.

(3) The stacks should be evenly spaced and contain graded timber.

(4) The stacks should be raised off the ground on rigid supports, and the layers of timber should be separated by evenly spaced battens to permit free circulation.

(5) Stacks should be weighted to prevent warp and be protected from direct rain and sun-rays.

Figure 1 shows a cheap and good method of stacking sawn timber, Figure 2 one for stacking round timber, and Figure 3 one for half-round posts, etc.

**Kiln Drying.**—Present day kilns which have been evolved from a room heated by an open fireplace must be considered to be something more than a mere apparatus for evaporating moisture. A fundamental part of them is the precision of control which they permit over the physical conditions which govern the extraction of moisture from wood with the least possible injury to the material. This precision of control, which is the keynote of success, can only be obtained by an operator who has a technical training and experience. Bad operation, leading to improperly dried lumber, has been the cause of the belief that it is impossible to season certain timbers, and therefore their use has been limited.

The original kilns used in wood drying consisted of a room heated by a stove or oven, and later, after the advent of steam, by coils. This "hotbox" type failed, due to the extremely poor circulation possible in them. They were replaced by "ventilated kilns," which had dampers let into the walls to admit cold air at the base and permit the escape of hot air at the top. They were based on the fact that hot air, being lighter than cold air, would naturally rise. Several forms of this type of kiln with humidity control introduced are still in use, and though drying is less rapid in them than in the more recent types of kilns, very good results can be obtained by their use. A further improvement was the introduction of a fan to assist circulation; but in all these kilns, since there was no introduction of humidity, the results were not entirely satisfactory.

It was not until during the war, when the world's stock of seasoned timber ran short and huge quantities were re-

quired for various purposes, that the problem of producing thoroughly seasoned wood free from defects was intensively investigated.

The Forest Products Laboratory, Wisconsin, carried out the bulk of the work, and Mr. H. D. Tiemann developed a high humidity regulated kiln. In this type of kiln, which is in wide use at present, wood green from the saw can be perfectly seasoned in a very short time.

At the same time development proceeded along other lines. The Sturbeveyent Company and others improved their fan kilns by introducing humidity controls, and Eriths worked on progressive kilns for handling large quantities of the same species.

Prior to describing the most suitable kilns for Rhodesian use it is desirable to discuss the advantages of kiln drying, how it operates and what is necessary to make it successful.

The disadvantages of a properly operated kiln are almost negligible, the cost of operating and installation being the only ones of any importance, and these are more than counterbalanced by other economic factors.

Kilns have many advantages, chief among which are:—

(1) A complete control can be exerted over the drying mediums (circulation, humidity and temperature).

(2) There is a considerable saving of time and consequent saving in interest on the capital otherwise tied up in idle stock, and also a saving in storage costs.

(3) There is a large reduction in the yard space required by storing timber.

(4) There is a considerable saving in degrade caused by warping and cracking.

(5) Casehardening can be prevented and eliminated.

(6) Fungus and insect attack can be eliminated. The risk of their attack in storage is lessened.

(7) The timber can be seasoned to a desired moisture content, and even moisture distribution is assured.

(8) The hygroscopicity is reduced.

(9) A better quality product is produced from timber which air seasons with difficulty, with a smaller loss from defects, which can be almost completely eliminated.

(10) There is a quicker turn-over on the capital invested in stock.

(11) The risks from fire are lessened and insurance costs are reduced.

(12) Orders for seasoned material can be more promptly filled.

The fact that every important lumber or woodworking plant in America is using kilns shows that from a commercial aspect kilns must have decided advantages. A kiln is simply a moisture-proof chamber in which drying can be regulated in accordance with the optima requirements of the wood. The kiln operator has at his disposal three factors with which to control drying—these are circulation, humidity and temperature.

Circulation is essential to carry heat to the wood and moisture away from it. It should be adequate at all times, since poor circulation causes high humidities and low temperatures and thus considerably retards drying.

Heat is necessary to dry the moisture from the timber and humidity to control the rate of drying. A high class kiln in which precision in control of these factors is possible should conform to the following specifications:—

(1) They should hold the maximum amount of lumber consistent with proper piling and circulation.

(2) They should have a positive equal and sufficient circulation of air throughout the kiln and timber entirely independent of the temperature and humidity.

(3) There should be a means of heating the kiln uniformly and maintaining it at any desired point for any desired length of time. The temperature should be uniform as far as possible in every part of the pile of timber, and should be under such control that it may be raised or lowered to any point within the desired limits.

(4) There should be a means of humidifying the air so that humidity can be added in such a way that it is uniform throughout the kiln and pile. It should not be in streaks or strata. Any percentage of humidity should be possible within the required limits and should be independent of temperature.

(5) There should be a means of removing the excessive moisture that may be given up by the lumber. This should be removed uniformly so that it will not produce a gathering of damp air at any one point.

(6) There should be automatic control of temperature and humidity so that they will stay at the point set, regardless of changes in the atmosphere, steam pressure carried or any other factor that may have influence to change these conditions.

(7) There should be a means of keeping continuous record of conditions in the kiln, both as to temperature and humidity, so that it can be seen at once whether these conditions have remained constant at the desired point.

In such a kiln success can be assured by—

(1) Employing a skilled operator, since on him depends the success or failure of the operation.

(2) Piling the timber correctly and weighting it to prevent warp, cupping and twisting.

(3) Controlling the rate of evaporation so that it does not exceed the rate of transfusion from the centre to the surface.

(4) Causing even drying to take place.

(5) Heating the wood clear through prior to commencing drying to permit free transfusion and prevent casehardening.

(6) Suiting the humidity to the timber condition and reducing it in proper proportion as drying progresses.

(7) Expelling all free water before fibre saturation point is reached.

(8) Keeping the temperature uniform and as high as the species will permit.

(9) Regulating the rate of drying by the humidity and not by the circulation, which should be adequate at all times.

(10) Drying the wood to the desired moisture content; over-drying causes brittleness.

There are two types of kilns which present themselves as eminently suitable for Rhodesian conditions and for handling local products. These are:—

(1) the natural draught (ventilated); and

(2) the internal heating, external fan, high humidity (spray pipe) controlled kiln.

The main differences between these kilns are that in the latter circulation is created by a fan, and thus drying is more rapid and can be more precisely controlled. The former is cheaper to construct, and for the small producer is quite satisfactory, providing he is prepared to wait for a longer period for drying to be completed.

No definite period can be laid down for drying, since this depends on the species and dimensions of the timber. It is not until a number of trial runs with any one type of kiln, species and dimension that drying schedules can be drawn up to indicate the optima requirements of each species and dimension. As a general rule, however, in drying native and locally grown species, temperatures of from 120 degrees F. to 160 degrees F., with initial humidities of about 80 per cent., being reduced as drying proceeds to about 40 per cent., would appear to give the most satisfactory results. Drying should progress at the rate of about 2 per cent. decrease in moisture content per diem in thin timber and proportionately less in thicker material. In both types of kilns provision is made for frequent steamings during drying in order to relieve stresses and correct defects.

For the reason that the construction and cost of a kiln and its operation must depend entirely on the locality in which it is to be situated and for the purposes in which it is to be employed, no definite method of operation, cost or size of kiln, etc., can be specifically set down here; but plans, specifications, costs and methods of operation can be given in detail to those desiring them on application to the Forest Office, Salisbury.

The following table indicates the difficulties which are likely to arise in kiln drying, the reasons for their occurrence, the methods of preventing and controlling them. This table can be applied to any kiln or species.

| Defects. | Reasons for occurrence. | How to prevent them. | How to remedy them. |
|---|---|---|---|
| **Casehardening.** | (1) Too rapid surface drying, caused by either or both— (a) too high temperature; (b) too low humidity.<br>(2) Uneven drying, due to— (a) sluggish or uneven circulation; (b) too large fluctuations of temperature and humidity. | (1) Use higher humidity and lower temperature.<br>(2) Speed up circulation and make it uniform.<br>(3) Obtain more uniform control of temperature and humidity.<br>(4) Frequent intermittent steaming.<br>(5) Make frequent tests for moisture distribution and casehardening. | (1) Raise humidity to 100 per cent. by steaming for a short period; half hour to two hours for thin lumber and longer for thick, hard stock.<br>(2) Maintain high relative humidity, 70 per cent. or over, for a period of 6 to 18 hours, depending on species and thickness. |
| **Over-steaming.**<br>**Reversed stresses.** | (1) Too long or too frequent steaming to rectify casehardening, etc. | (1) Refrain from over-steaming. | (1) Prolonged steaming and re-drying.<br>(2) Stack in air for sufficient time to allow all stresses to become relieved. |

| Defects. | Reasons for occurrence. | How to prevent them. | How to remedy them. |
|---|---|---|---|
| Uneven drying. | (1) Temperature and humidity vary too much throughout the kiln.<br>(2) Temperature and humidity fluctuate too much: lack of control.<br>(3) Circulation is—<br>(a) inadequate;<br>(b) unbalanced (short circuits).<br>(4) Timber improperly stacked.<br>(a) Too close.<br>(b) Overhanging ends.<br>(5) Leaky doors; drip from ceiling.<br>(6) Leaky steam pipes. | (1) Balance heating system.<br>(a) Adequate drainage of coils; repair leaks.<br>(b) Air vent coils (in natural draught).<br>(c) Use steam and oil separators with exhaust steam.<br>(d) Increase steam pressure.<br>(e) Re-model heating system.<br>(f) Automatic regulation.<br>(2) Balance circulation by—<br>(a) regulating stack dampers;<br>(b) proper proportioning of fresh air supply;<br>(c) use baffles, repair doors;<br>(d) leave more air space in piles;<br>(e) instal fans, blowers, condensers or sprays. | (1) Frequent periodic steaming.<br>(2) Final steaming or high humidity treatment.<br>(3) Leave timber in dry storage longer.<br>(4) Use modern drying systems. |
| Surface checking. | (1) Surface dried too fast for the core during the early stages of drying.<br>(2) Uneven drying, due to—<br>(a) inadequate and uneven circulation;<br>(b) boards protruding from end of pile;<br>(c) improper piling.<br>(3) Dripping from ceiling.<br>(4) Checks incurred during air seasoning. | (1) Secure better circulation.<br>(2) Use high humidities at beginning of run.<br>(3) Frequent periodic steaming.<br>(4) Better piling.<br>(5) Insulate ceiling or use ceiling coils. | (1) Cannot be remedied, but further checking can be prevented by using same treatment as for relief of casehardening.<br>(2) Other checks will close if dried slowly and an even moisture content. |

| | | | |
|---|---|---|---|
| Warping; twisting; cupping. | (1) Improper piling.<br>(a) Uneven stickers; too few of them; incorrectly placed.<br>(b) Overhanging ends.<br>(2) Unbalanced circulation.<br>(a) Timber too closely piled.<br>(b) Stagnant ventilation; leaky doors.<br>(c) Poor kiln design.<br>(3) Too severely casehardened. | (1) Careful piling.<br>(a) Stickers uniform in size, adequate in number, evenly spaced.<br>(b) Keep end stickers flush with ends of board; no overhanging ends.<br>(c) Allow air spaces between edges of boards; if necessary, allow flue in pile.<br>(d) Keep all corners of truck solid.<br>(2) Improve circulation.<br>(a) Careful piling.<br>(b) Clean out all flues.<br>(c) Use air baffles in kiln.<br>(d) Speed up circulation by condenser coils, sprays, fans or blowers (jet type).<br>(3) Prevent casehardening.<br>(a) Frequent periodic steaming.<br>(4) Place heavy weights on top of the load. | (1) Relieve casehardening by steaming (*vide* above).<br>(2) Remove lumber from kiln, re-pile properly, again place in kiln and steam for from 6 to 24 hours. Continue drying process, using less severe drying conditions. |
| Honeycombing; hollow boring | (1) Casehardening, followed by surface checking, due to—<br>(a) too severe drying schedule;<br>(b) failure to steam periodically after appearance of surface checks;<br>(c) failure to use higher humidities after surface checks appear. | (1) Prevent surface checking and casehardening by—<br>(a) more moderate drying schedule.<br>(2) Frequent periodic steaming.<br>(3) Balance up circulation through piles. | (1) Once timber is badly honeycombed, no known treatment will take it out.<br>(2) Slight cases can be prevented from becoming severe by frequent steaming and use of lower temperatures and higher humidities. |

| Defects. | Reasons for occurrence. | How to prevent them. | How to remedy them. |
|---|---|---|---|
| **Collapse.** | (1) Certain woods containing very high moisture contents at time of drying (85 to 200 per cent.).<br>(2) Unexplained character in some species, e.g., Eucalypts.<br>(3) Too rapid surface; dry in early stages.<br>(4) Severe casehardening.<br>(5) Temperature too high. | (1) Use lower temperatures; higher humidities; speed up circulation.<br>(2) Dry slower if necessary.<br>(3) Prevent casehardening by periodic steaming. | (1) Difficult to bring back to normal.<br>(2) Possible remedy :—<br>(a) Steam timber for a long time until wood has soaked up water and swelled.<br>(b) Re-dry at lower temperatures and higher humidities. |
| **End splitting and checking.** | (1) Too rapid end drying and too slow centre drying.<br>(2) Uneven stickers irregularly placed.<br>(3) Overhanging ends.<br>(4) Too much circulation at ends and too little in pile.<br>(5) Leaky doors.<br>(6) Checks present before kiln drying. | (1) Pile properly.<br>(a) Place stickers flush with ends of boards at one end of pile and as near as practicable at the other.<br>(b) Leave plenty of air spaces in the pile.<br>(2) Baffle air so as to make it go through the pile.<br>(3) Paint end of stack with moisture and heat-resisting material.<br>(a) Eight bitumen, one cement.<br>(b) Resin and lamp black (heated).<br>(c) Gilsonite and asphaltum.<br>(4) Cut off split ends before stacking. | (1) Once damage is done, it cannot be repaired.<br>(2) Further damage can be prevented by first steaming, then drying at higher humidities.<br>(3) Periodic steaming. |

| | | | |
|---|---|---|---|
| **Mildew and moulds.** | (1) Poor circulation.<br>(2) Low temperature, high humidity. | (1) Speed up circulation.<br>(2) Keep drying above 145° F. | (1) Steam one hour at 160° F.<br>(2) Finishing drying above 140° F. |
| **Blue stain.** | (1) Slow air drying in a humid climate.<br>(2) Improper piling. | (1) Kiln dry immediately after sawing.<br>(2) Dip in soda solution. | (1) None.<br>(2) Usually dresses out. |
| **Brown stain.** | (1) Kiln dried at too high a temperature. | (1) Use moderate drying schedule.<br>(2) Speed up circulation. | (1) No remedy.<br>(2) Usually dresses out. |
| **Red stain.** | (1) Leaky steam coils.<br>(2) Live steam striking timber.<br>(3) Too much steaming. | (1) Repair leaks.<br>(2) Use low pressure steam if sprays are near timber. | (1) No remedy.<br>(2) Usually dresses out. |
| **Borers, etc.** | (1) In felled timber.<br>(2) Get into timber before placed in kiln.<br>(3) Improper piling. | (1) Kiln dry immediately after sawing.<br>(2) Impregnate with toxic solution.<br>(3) Destroy badly-infected timber before completing pile. | (1) Steam for one hour at 160° F.<br>(2) Finish drying at or above 140° F. |

**Care of Seasoned Timber.**—A frequent cause of the unsatisfactory behaviour of seasoned timber is the lack of appreciation of the necessity of exercising reasonable precautions after the material has been seasoned.

Too much stress is usually put on the length of time between the utilisation of and cutting of a piece of timber from a tree as a factor of successful seasoning. This period only becomes important when timber is stored under satisfactory conditions, e.g., if timber is stacked in the open without protective covering it will be in a much better condition at the end of six months than at the end of ten or twenty years.

Contact with water or exposure to very moist conditions should be avoided in the storage of seasoned timber. The former is of course the more deleterious, but if exposure is prolonged in the case of the latter, timber will have too high a moisture content for it to be used satisfactorily. Seasoned timber must be stacked under shelter, preferably in a building affording shelter from driving rains. It is essential for it to be raised off the ground, though it may be block stacked.

**Moisture-Proof Coatings.**—Paints, polishes and varnishes are usually considered only from the appearance standpoint, but it must not be forgotten that they have at least one other important property. By retarding change in moisture content they have the very beneficial effect of reducing the work of the timber. Entire prevention of moisture change in timber is only possible in a sealed case. Some coatings, however, are effective in this respect, though others considered effective are of comparatively low value.

Tests given in Technical Note 181 of the United States Forest Products Laboratory are as follows:—

Table showing Results of Moisture Absorption Tests on Panels coated with Different Preparations.

Percentages are based on average amounts of moisture absorbed per unit surface area by coated and uncoated panels subjected to a humidity of 95 to 100 per cent. for 14 days.

| | Percentage efficiency. |
|---|---|
| Aluminium leaf process—asphalt paint base ... ... | 98 |
| Three coats spar varnish coated with vaseline ... ... | 98 |
| Three coats asphalt paint ... ... ... ... ... ... ... ... | 96 |
| Aluminium leaf process— | |
| Spar varnish base ... ... ... ... ... ... ... ... ... ... | 95 |
| Cellulose lacquer base ... ... ... ... ... ... ... ... | 94 |
| Oil paint base ... ... ... ... ... ... ... ... ... ... ... | 93 |
| Three coats aluminium bronze, quick drying ... ... | 92 |
| Heavy coating of paraffin ... ... ... ... ... ... ... ... | 91 |
| Three coats rubbing varnish ... ... ... ... ... ... ... | 89 |
| Three coats enamel ... ... ... ... ... ... ... ... ... ... | 88 |
| Three coats orange shellac ... ... ... ... ... ... ... ... | 87 |
| Three coats cellulose lacquer ... ... ... ... ... ... ... | 73 |
| Sheet pyralin 5/1,000 the inch thick, glued to wood | 68 |
| Three coats graphite paint ... ... ... ... ... ... ... ... | 61 |
| Three coats spar varnish ... ... ... ... ... ... ... ... | 60 |
| Three coats white lead oil ... ... ... ... ... ... ... ... | 54 |
| Five coats linseed oil, applied hot ... ... ... ... ... ... | 38 |
| Two coats wax ... ... ... ... ... ... ... ... ... ... ... ... | 38 |
| No coating ... ... ... ... ... ... ... ... ... ... ... ... ... | — |

It will be noted that linseed oil has a comparatively low value as a moisture-resistant coat, and white lead paint is also inefficient.

In timber utilisation, as a rule, only the faces which are seen are treated. This is due to the lack of appreciation of the importance of finishes in resisting moisture change. It is a very unsatisfactory feature, e.g., a table top is usually only coated on the top, with a result that there is an unequal absorption of moisture, the lower surface absorbing more than the upper, with a resultant difference, swelling and a tendency to cup. If drying takes place the top will shrink unevenly and tend to arch. It is necessary, therefore, to treat all surfaces alike, although on unseen surfaces there is no need to involve expense by attention to appearance.

Panels should be treated with care, since their ends are liable to more variation than the sides in any case, and will vary more if the sides are treated and not the ends.

Transparent coverings which will withstand the climatic conditions and maintain a good appearance are always a trouble to find, but for timber which is likely to be exposed to the weather, drying oils are far more satisfactory than non-drying oils, whilst hardwood finishes of the varnish type are best of all.

# How to Make Use of the Fencing Law.

As the provisions of the "Fencing Ordinance, 1904," have been applied to the whole of the Colony, it is competent for any landowner to require his neighbours to join in or contribute to the construction of fences on mutual boundaries, in such proportion as may be agreed upon between them. To this end he should serve a notice in writing on the person he desires to contribute, specifying the boundary to be fenced, the kind of fences and mode of erection proposed. (*See specimen letter A.*)

If within three months no agreement is arrived at in respect of any of the above points, the matter is to be settled by arbitration. (*See specimen letter B.*)

If either of the parties fails to carry out any of the work of construction that he has agreed to do, or has been allotted by an arbitrator, the other party may carry it out and recover the share of the cost that the first party should have contributed, in any Court of competent jurisdiction.

The person called upon to contribute to the construction of a dividing fence may, by giving notice within one month of the amount being fixed for which he is liable, pay such amount by equal annual instalments, with interest at 6 per cent. per annum added. (*See specimen letter C2.*) If the capital amount does not exceed £100 the payments may be extended over five years, and if the amount exceeds £100 the payment may be extended over ten years. In a schedule to the Ordinance there is given a table for calculating the amounts payable every year for five or ten year periods.

When an owner is absent, or cannot be found, or any land is unoccupied, the owner of any adjoining land who wishes him to contribute to the cost of a fence must advertise at least once a month for three months in the *Gazette* and a paper circulating in the district, requiring him to contribute. (*See specimen notice D.*) He may then obtain an order from

the Magistrate authorising him to proceed with the construction, and in due course a certificate of the amount due by the owner of the adjoining land. This certificate must be lodged with the Registrar of Deeds, who will make an entry in respect of the land affected, which entry will constitute a hypothecation of the land.

Tenants, excepting those whose unexpired term of lease does not exceed one year, are liable to pay interest at the rate of 6 per cent. per annum on half the cost of construction, and tenants who have the right of purchase are liable to have any sum paid by the owner for construction of fence added to the purchase price.

Owners of land on either side of dividing fences are liable for the cost of repairs in equal proportion. An owner can serve on his neighbour a notice requiring him to assist in repairing such fence (*see specimen letter E*), and if the second owner refuses or neglects to do so, after one week the first owner can make the repairs and recover his share from the second. Fences destroyed by accident may be repaired without notice. If the fence is damaged through the neglect of either of the parties, he only is liable for the whole cost of repairs.

The Ordinance does not affect any substantial fence already erected at the time of the coming into operation of the Ordinance.

If the owner of any land shall have erected by 10th December, 1926, a fence on the boundary of his land, and any other person shall adopt any means by which such fence shall be rendered of beneficial use to himself, he shall be liable to pay the owner of the fence interest at 6 per cent. per annum on half the then value of so much of the fence as he makes use of, and shall also be liable for half the cost of repairs.

Any person erecting a fence on land covered with bush is entitled to clear the bush for a width not exceeding six feet on either side of such fence, and to remove any tree standing in the direct line of such fence. The cost of clearing may be added to the cost of the fence in cases where any part of the cost of the fence is to be recovered from another party.

Where a river forms the boundary of contiguous lands, but is not capable of resisting the trespass of animals liable to

be impounded, it shall be competent for the owners to agree upon such a line of fence on either side of the river as shall secure such fence from the action of floods; and in the event of their not agreeing upon such a line of fence, and whether any or what compensation in the shape of an annual payment shall be paid to either party for loss of occupation of land, the question shall be settled by arbitration.

If the owner of any land shall clear the same of inflammable materials for the space of fifteen feet from any boundary fence and the owner of the contiguous land shall neglect so to clear his land, such owner shall be liable for any damage done to the fence by fire due to such neglect and is required to make good the damage within one month, failing which the neighbouring owner may make good the damage at the expense of the owner in default.

Every person engaged in constructing or repairing a fence under this Ordinance may enter upon the contiguous lands, if necessary, at any reasonable times and do any reasonable acts thereupon that may be required for the construction or repair of the fence, but he may not enter upon any cultivated ground, garden, plantation or pleasure ground or cut down or lop any fruit or ornamental trees or shrub without the consent of the owner.

Any owner to whom any amount may be due by any person by way of contribution towards the construction of a dividing fence may call upon such person to pass a mortgage bond upon his land. (*See specimen letter F.*) If the said person shall refuse or fail to pass such mortgage bond the owner may notify to the Registrar of Deeds the fact that the amount is owing and no mortgage has been passed. (*See specimen letter G.*) The Registrar of Deeds shall then notify the person named, the fact and particulars of the notification received from the first party, and if no objection is lodged within three weeks the amount of the debt is registered in the Deeds Office and no transfer or mortgage on the property can be passed until the bond above referred to has been duly passed. Should any objection be raised, no entry shall be made in the Deeds Office registers except with the consent of the said person or upon the order of a competent Court.

An "owner" is described in the Ordinance and amending Act as—

(a) Any person, company, co-partnership or public body in actual occupation of or entitled as owner to occupy any land alienated from the British South Africa Company, or entitled by virtue of any certificate or document conferring a right to claim any land from the British South Africa Company.

(b) The Council or other governing body of any Municipality or Corporate Town, in respect of all lands to which or to the use of which the inhabitants of such Municipality or Corporate Town have acquired or may hereafter acquire a common right.

(c) Any person lawfully occupying or holding land in accordance with the provisions of any agreement, made before or after the taking effect of this Act, empowering the Government to allot lands upon the promise of title, subject to the fulfilment by the allottee of prescribed conditions.

It should be noted that the Government is not amenable to the fencing laws in respect of boundary fences between Crown land and privately owned land and between native reserves and privately owned land, nor is it legally bound to contribute towards the cost of erecting fencing along declared roads passing through privately owned land.

The Government has, however, accepted a limited amount of financial responsibility for the cost of erecting the three above-mentioned types of boundary fences. In other words, sums of money are voted annually in the Votes of the Department of Lands, the Native Department and the Department of Mines and Works, from which claims in respect of boundary and road fences can be met, but only up to the amount voted annually for this purpose.

Applicants desiring Government assistance towards the cost of fencing boundaries between Crown lands and their farms should therefore apply to the Department of Lands, and those desiring to fence between their farms and native reserves, to the Chief Native Commissioner. The Department of Mines and Works should be approached for a contribution towards the cost of fencing along declared roads.

## SPECIMEN LETTERS.

*A.—Letter calling upon a neighbour to join in the cost of a fence.*

Dear Sir,—

I beg to inform you that I propose to erect a dividing fence on the border of this farm and that of...................... and call upon you, in terms of section 6 of the "Fencing Ordinance, 1904," to contribute towards the cost thereof. The line concerned runs from....................to..................

I propose the erection of.................(*here state kind of fence to be erected, material, cost, etc.*) and that................ (*here state proposals for erection, by what means, cost, etc.*)

Yours faithfully,

*B.—Letter calling upon a neighbour to go to arbitration.*

Dear Sir,—

With reference to my letter of...................(see *A*) in view of our failure to arrive at an agreement with regard to ......................(*here state points on which no agreement arrived at*), I now propose that the matter should be settled by arbitration in terms of clause 7 of the "Fencing Ordinance, 1904," and have nominated Mr......................to act as arbitrator on my behalf. Will you, please, nominate an arbitrator to act for you?

Yours faithfully,

*C1.—Letter acknowledging A and agreeing to share expenses.*

Dear Sir,—

I have your letter of.................regarding the erection of a joint fence, and in reply beg to state that I am prepared to agree to the terms suggested and to pay half cost of all expenses (*or any other proposals as the case may require*).

Yours faithfully,

*C2.—Letter acknowledging A and requesting to pay by instalments.*

Dear Sir,—

I have your letter of.................regarding the erection of a joint fence. In reply, I beg to state that I am prepared to agree to the fence suggested, but wish to avail

myself of the provisions of section 9 of the "Fencing Ordinance, 1904," and to pay the amount of my share of the cost by instalments, with interest at the rate of 6 per cent. per annum, extending over a period of....................years.

Yours faithfully,

(See in reply specimen *F*.)

*D.—Notice in* Gazette *and Newspaper calling on owner whose address is unknown to contribute.*

To A.B., owner of farm............................situated in the District of..........................

Take notice that I intend to fence my farm.................. and in terms of sections 5 and 11 of the "Fencing Ordinance, 1904," I hereby call upon you to contribute towards the cost of construction of the fencing of our common boundaries from...................to....................

(Sgd.) C. D.

*E.—Letter calling on neighbour to assist in repairing a boundary fence.*

Dear Sir,—

I beg to inform you that the boundary fence dividing our farms....................and....................is out of repair (*here state nature and extent of damage*). I therefore beg to call upon you to assist in repairing the same in terms of section 15 of the "Fencing Ordinance, 1904."

Yours faithfully,

*F.—Letter calling upon neighbour to pass Mortgage Bond.*

Dear Sir,—

I beg to acknowledge your letter of....................(see specimen *C*) and note that you wish to pay your share of the cost of our joint fence by instalments. I am agreeable to this, provided you pass a mortgage bond over your farm in terms of section 29 of the "Fencing Ordinance, 1904" (*or other security can be arranged by mutual agreement*).

Yours faithfully,

*G.—Letter to Registrar of Deeds notifying debt owing by neighbour for fencing.*

Sir,—

In terms of section 30 of the "Fencing Ordinance, 1904," I beg to notify you of the undermentioned debt incurred in connection with a joint boundary fence between the farms ........................and........................, and to request you to register the same in the Register of Deeds.

Name of farm............................

Amount owing............................

Situation and name of property in respect of which Bond has been demanded..........................

Date of the grant or transfer of the said property to the said person..........................

The above amount has been agreed upon, *or* ascertained according to law, and the person above named has been duly called upon to pass a mortgage bond and has failed to do so.

I am,

Your obedient servant,

# Boring Regulations.

The *Government Gazette* of 20th September contains new regulations governing the hire of Government drills. The main alteration from the previous regulations is to the effect that advances from Irrigation Loan Funds are now procurable for the repayment of boring charges. These loans are repayable over a period of years, the maximum being fifteen years.

# Correspondence.

*[No responsibility is accepted by this Journal for the views expressed by correspondents.]*

The Editor,
*The Rhodesia Agricultural Journal.*

Dear Sir,

The following is an analysis showing the constituents of interest in a meal made by grinding sunflower heads and seeds and the leaves together. The stalk I find hard to grind, as the strings of fibre clog the plates. A number of farmers have bought feed-grinding machines this season, which shows a move in the right direction, especially when directed to the production of fat stock.

| | | |
|---|---|---|
| Protein ... ... ... ... ... ... | 10.94 | per cent. |
| Fat ... ... ... ... ... ... ... ... | 9.42 | ,, |

I am, etc.,

J. M. MOUBRAY.

# Southern Rhodesia Veterinary Report.

## August, 1929.

### AFRICAN COAST FEVER.

No cases were recorded during the month under review. The slaughter of the infected herd on Mari Plumbi, Mazoe district, was completed.

### TRYPANOSOMIASIS.

Eight cases were recorded on the farm Craigmore, Melsetter district, of which two head died; the remainder were treated and showed a distinct improvement in condition. One case also occurred in the Sabi Valley.

### QUARTER-EVIL.

Very few cases reported.

### ANTHRAX.

Two cases occurred in the Mazoe district, and all the cattle on the farm were inoculated.

### SCAB.

Two flocks in Hartley, one in Umtali and several in Victoria district were placed under licence.

### CUTANEOUS MYIASIS (SCREW WORM) IN CATTLE.

A few cases only reported.

### IMPORTATIONS.

From the Union of South Africa:—Bulls 10, cows 124, heifers 65, calf 1, horses 19, mules 69, donkeys 34, sheep 1,752, goats 427, pigs 31.

## EXPORTATIONS (CATTLE).

To the Union of South Africa:—For local consumption, 1,358; for overseas, 6,457. To Belgian Congo:—Slaughter 2,530, breeding 684. To Northern Rhodesia:—Breeding 21.

## EXPORTATIONS (MISCELLANEOUS).

Union of South Africa:—Horses 7, sheep 19, goats 64, pigs 149. Belgian Congo: Sheep 62, pigs 213. Northern Rhodesia:—Donkeys 14, sheep 120, goats 55. Portuguese East Africa:—Sheep 40, goats 64.

## COLD STORAGE EXPORTS TO THE CONGO.

Beef: Carcases 311¼, livers 313, tails 278, hearts 268, tongues 313, brains 268, cheeks 328. Calves: Carcases 60, heads 6, feet 22. Sheep: Carcases 35, tongues 40, brains 35. Pigs: Carcases 35.

Note.—50½ beef carcases returned in July report were exported to England.

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# September, 1929.

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## AFRICAN COAST FEVER.

Mazoe District.—The disease extended to two kraals in the Chiweshe Native Reserve adjoining the infected farms. Nine cases were recorded, and it was decided to slaughter the two herds affected.

An extension also occurred to an adjoining farm Villa Franca. Mortality, one.

Charter District.—The herd on the infected farm Victor has been slaughtered and the meat disposed of.

## ANTHRAX.

One case occurred adjoining an infected area on the Ntabezinduna Reserve, Bubi district, and all in-contacts were inoculated.

## TRYPANOSOMIASIS.

Two further cases reported on Craigmore farm, Melsetter district.

## QUARTER-EVIL.

Very few cases reported.

## SCAB.

One flock placed in quarantine at Umtali.

## INTERNAL PARASITES IN SHEEP.

Considerable mortality has been reported due to wire and nodular worms.

## IMPORTATIONS.

From the Union of South Africa: Bulls, 69; cows, 99; heifers, 70; calves, 18; horses, 25; mules, 19; donkeys, 214; sheep, 1,485; goats, 505; pigs, 6.

## EXPORTATIONS (CATTLE).

To the Union of South Africa: For local consumption, 1,699; for overseas, 4,406. To Belgian Congo: Slaughter, 884; breeding, 7. To Northern Rhodesia: Breeding, 183.

## EXPORTATIONS (MISCELLANEOUS).

Union of South Africa: Sheep, 33; goats, 43. Belgian Congo: Pigs, 213. Northern Rhodesia: Sheep, 62; goats, 40; horses, 2. Portuguese East Africa: Sheep, 25; goats, 25.

## COLD STORAGE EXPORTS TO THE CONGO.

Beef: Carcases, 304; livers, 299; tails, 293; hearts, 304; tongues, 304; brains, 241; cheeks, 539. Calves: Carcases, 5; heads, 5; feet, 20. Sheep: Carcases, 12; tongues, 12; brains, 12. Pigs: Carcases, 15.

G. C. HOOPER-SHARPE,
Acting Chief Veterinary Surgeon.

# Southern Rhodesia Weather Bureau.

SEPTEMBER, 1929.

**Pressure.**—The barometric pressure during the month was uniformly low, varying from 0.006 in. below normal at Salisbury to 0.033 in. below normal at Livingstone.

**Temperature.**—Temperature was generally high. The mean monthly temperature varied from 4.0° F. above normal at Melsetter and Fort Victoria to 1.1° F. above normal at Gatooma. The mean maximum temperature varied from 4.5° F. above normal at Victoria to 0.2° F. below normal at Gatooma. The mean minimum temperature varied from 4.5° F. above normal at Matopos to 1.4° F. above normal at Mount Selinda. The relative humidity was generally about normal.

**Rainfall.**—The schedule of rainfall is attached.

ZONE A:—

| | |
|---|---|
| Bulalima-Mangwe— | |
| Centenary | .10 |
| River Bank | .01 |
| Bulawayo— | |
| Fairview Farm | .01 |

ZONE B:—

| | |
|---|---|
| Belingwe— | |
| Tamba | .45 |
| Bulalima-Mangwe— | |
| Edwinton | .18 |
| Garth | .07 |
| Retreat | .12 |
| Sandown | .31 |
| Tjankwa | .12 |
| Tjompani | .06 |

| | |
|---|---|
| Chibi— | |
| Bubye | .25 |
| Mtendelende | .17 |
| Gwanda— | |
| Mtetengwe | .02 |
| Tuli | .02 |
| Matobo— | |
| Bon Accord | .10 |
| Matopo Mission | .43 |
| Mtshabezi Mission | .08 |
| Rhodes Matopo Park | .10 |
| Umzingwane— | |
| Balla Balla | .14 |
| Hope Fountain | .01 |
| ZONE D:— | |
| Inyanga— | |
| Inyanga | .08 |
| Juliasdale | .03 |
| ZONE E:— | |
| Insiza— | |
| Roodeheuvel | .21 |
| Melsetter— | |
| New Year's Gift | .06 |
| ZONE F:— | |
| Melsetter— | |
| Mount Selinda | .08 |
| Vermont | .12 |
| Umtali— | |
| Cloudlands | .03 |

# Export of Cattle from Southern Rhodesia, 1929.

| Month | Union | | England. | Congo | | N. Rhodesia | Portuguese East Africa. | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Slaughter | | Slaughter | | | | | | | |
| | Johannesburg | I.C.S. for overseas | On hoof | Slaughter | Breeding | Breeding | Slaughter | Trek | Breeding | |
| January ... | 66 | ... | ... | 2,222 | 272 | 12 | ... | ... | ... | 2,572 |
| February ... | 84 | ... | ... | 656 | ... | ... | 12 | ... | ... | 752 |
| March ... | 12 | ... | ... | 1,845 | 1,803 | 19 | 24 | ... | ... | 5,056 |
| April ... | 242 | 1,842 | 75 | 2,933 | 1,131 | ... | 38 | ... | 22 | 6,283 |
| May ... | 224 | 4,318 | 620 | 1,508 | 2,966 | 17 | 24 | ... | ... | 9,677 |
| June ... | 538 | 6,322 | ... | 2,989 | 936 | 34 | 48 | ... | ... | 10,867 |
| July ... | 799 | 6,417 | ... | 1,417 | 85 | 14 | ... | ... | ... | 8,732 |
| August ... | 1,358 | 6,457 | ... | 2,530 | 684 | 21 | ... | ... | ... | 11,050 |
| September ... | 1,699 | 4,406 | ... | 884 | 7 | 185 | ... | ... | ... | 7,179 |
| October ... | | | | | | | | | | |
| November ... | | | | | | | | | | |
| December ... | | | | | | | | | | |

## Dates of Meetings of Farmers' Associations, Southern Rhodesia.

| Name of Association. | Place of Meeting. | Secretary. | Nov. | Dec. |
|---|---|---|---|---|
| | | | 1929 | 1929 |
| Ayrshire—Sipolilo | Various farms | G. H. Cautherley | 9 | 14 |
| Banket Junction | Banket Hotel | A. M. Hutchinson | 1 | 6 |
| Beatrice District | Farmers' Hall, Beatrice | W. Krienke | 28 | 26 |
| Bindura | Bindura Farmers' Hall | W. E. Fricker | 8 | 13 |
| Bromley | Farmers' Hall, Bromley Siding | E. Taylor | 6 | 4 |
| Bubi | Queen's Mine | C. H. Olsen | 12 | 10 |
| Bulawayo Landowners' and Farmers' Association | Library Buildings, Bulawayo | T. B. Hepburn | 14 | 12 |
| Chakari | Various farms | Lady Codrington | 20 | 18 |
| Daisyfield | Somabula (Nov.), Daisyfield (Dec.) | L. E. Edwards | 9 | 21 |
| Darwendale—Trelawney | Various farms | Charles H. Tanner | 27 | 25 |
| Eastern Districts | Farmers' Hall, Chidza | W. E. Richards | 9 | 14 |
| Enkeldoorn | Enkeldoorn | C. N. Ludlowe | 5 | 3 |
| Enterprise | Farmers' Hall | W. Stobart | 5 | 3 |
| Essexvale | Essexvale | Col. D. Judson | 17 | 15 |
| Felixburg—Gutu | Chomfuli (Nov.), Felixburg (Dec.) | E. C. Fleetwood | 9 | 14 |
| Figtree Branch, R.L. and F.A. | Figtree Hotel | The Secretary | 5 | 3 |
| Gadzema | Gadzema Hotel | H. G. M. Liddell | 8 | 13 |
| Gatooma | Speck's Hotel | Col. J. A. Smith | 16 | 21 |
| Gatooma (Golden Valley Branch) | Golden Valley Hotel | C. K. James | 9 | 14 |
| Gazaland (South Melsetter) | Farmers' Hall, Chipinga | J. Ward | 16 | 21 |
| Greystone | Quarrie Farm | P. J. van der Walt | 9 | ... |
| Gwanda | Lowenthal's Building, Gwanda | N. J. B. Nilson | 16 | 21 |
| Hartley | Hartley Hotel | Mrs. F. C. Watson | 9 | 14 |
| Headlands | Headlands | J. A. Eve | ... | ... |
| Hunter's Road | Hunter's Road | R. W. Twilley | 30 | 28 |
| Insiza South | Farm Lancaster | J. Campbell | ... | ... |
| Inyazura | Inyazura | W. P. Frudd | ... | 6 |
| Lalapansi | Lalapansi | B. J. Ingle | 9 | 14 |
| Lomagundi | Sinoia | F. W. Robertson | ... | ... |
| Lomagundi West | Various farms | A. A. Bisset | 10 | 8 |
| Macheke | Farmers' Hall, Macheke | R. O. Jackson | ... | ... |

| | | | | |
|---|---|---|---|---|
| Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association | Various Farms | T. R. Colam | 2 | 7 |
| Makwiro | Makwiro | W. L. Parsons | 15 | 20 |
| Marandellas | Marandellas Farmers' Hall | E. Cruikshank | 1 | 6 |
| Marandellas, Southern | Various farms | B. V. Cherry | 6 | 4 |
| Mashonaland | Mashonaland Farmers' Hall, Salisbury | C. Lamb | 8 | 13 |
| Matobo South | Farmers' Hall, Malundi Farm | A. G. Allan | 16 | 21 |
| Matopo Branch, R.L. and F.A. | Farmers' Hall, Malundi | W. Mirtle | 16 | 21 |
| Mazoe (Concession) | Various farms | Douglas Southey | 8 | 13 |
| Mazoe (Glendale) | Farmers' Hall, Glendale | James S. Brown | 13 | 11 |
| Melsetter | Court House, Melsetter | J. C. Kruger | 14 | 12 |
| Midlands Farmers and Stockowners | Royal Hotel, Gwelo | T. R. van Rooyen | 13 | 11 |
| Ngezi-Umniati | Harvieston, Enkeldoorn | Miss Harvie | 30 | 28 |
| North Umniati | ——— | J. F. Eagar | Not | received |
| Norton and Lydiate District | Norton | R. D. Palmer | 1 | 6 |
| Nyamandhlovu | Nyamandhlovu | R. D. McLean | ... | ... |
| Odzi District Farmers | Odzi Hotel | F. H. Burnett | 2 | 7 |
| Poorte Valley | Various places | A. D. Wilson | 16 | 21 |
| Que Que | Offices of the Que Que Sanitary Board | A. A. Ackerman | 16 | 21 |
| Rusape Farmers' Association | Rusape | R. Munch | 2 | 7 |
| Salisbury South | Various farms | P. Linton | 27 | 25 |
| Selukwe | The Hotel, Selukwe | W. T. Simpson | ... | ... |
| Shamva | Shamva Court House | W. Stanley-Stollard | 15 | 20 |
| Two Rivers Farming Association | Various farms | W. L. Parsons | 16 | 21 |
| Umboe (Branch of Lomagundi F.A.) | Various farms | C. W. S. Ford | 9 | 14 |
| Umvukwe Farmers' and Tobacco Growers' Association | Various ranches | Com. E. Wrightson | 9 | 14 |
| Umtali | Drill Hall, Umtali | A. Howat | 7 | 5 |
| Umvuma and District | Umvuma | S. T. Montgomery | Not | received |
| Victoria | Victoria | G. E. Lamb | 2 | 7 |
| Wankie District | ——— | F. H. Going | Not | received |
| West Umvukwe Farmers' Association | Various farms | G. H. Gordon | 2 | 7 |
| Western | Plumtree Hotel | The Secretary | 9 | 14 |
| Willoughbys | Willoughbys | A. E. Roberts | Not | received |

# Rhodesian Milk Records.

*Official Milk Records.*

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| Morgenzon Ermine | Friesland | 1,952.70 | 51.36 | 82 | W. R. Blackwell, Norton |
| Morgenzon Nonaber | do | 1,575.30 | 53.53 | 70 | do do |
| Morgenzon Kleinhans | do | 2,107.40 | 59.96 | 76 | do do |
| Boontjes of Kaalplaats | do | 1,382.00 | 41.04 | 60 | A. T. Holland, Chatsworth |
| Princess Park Primrose | do | 820.00 | 22.30 | 30 | G. A. Lyons, Bulawayo |
| Whinburn Daphne | do | 1,624.50 | 46.20 | 60 | R. R. Sharp, Redbank |
| Middleton's Zoe | do | 2,374.50 | 66.96 | 60 | do do |
| Whinburn Primrose | do | 2,665.50 | 108.46 | 90 | do do |
| Middleton's Pamphylia | do | 3,530.00 | 104.71 | 120 | do do |
| Whinburn Spottie | do | 3,276.00 | 114.13 | 120 | do do |
| Whinburn Annette | do | 808.50 | 21.66 | 30 | do do |
| Palmtree Peggy | do | 1,168.50 | 41.23 | 30 | J. S. Struthers, Sinoia |
| Palmtree Amy II. | do | 530.10 | 22.37 | 60 | do do |
| Palmtree Ida II. | do | 973.40 | 38.54 | 60 | do do |
| Palmtree Violet III. | do | 613.70 | 23.44 | 60 | do do |
| Palmtree Lucy | do | 1,017.10 | 38.75 | 60 | do do |
| Palmtree Pearl II. | do | 1,084.80 | 52.26 | 60 | do do |
| Palmtree Laura III. | do | 626.40 | 22.94 | 60 | do do |
| Palmtree Lettie | do | 906.10 | 32.88 | 60 | do do |
| Palmtree Violet I. | do | 1,181.00 | 45.13 | 60 | do do |
| De Grendel Selma | do | 4,501.00 | 116.04 | 120 | Government Farm, Gwebi |
| Melrose Corrie... | do | 3,020.00 | 70.14 | 60 | do do |
| Madge of Batavia | do | 951.50 | 28.92 | 30 | do do |
| Gwebi Beryl ... | do | 551.50 | 19.80 | 30 | do do |
| Brightwell Rain | Red Po | 1,984.80 | 60.82 | 60 | Government Farm, Matopos |

# RHODESIAN MILK RECORDS (continued).

## *Semi-official Milk Records.*

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| Primrose ... | Grade Friesland | 1,175.80 | 35.48 | 48 | W. R. Blackwell, Norton |
| Waterbloem ... | do | 1,176.70 | 35.23 | 50 | do do |
| Kleinbloem ... | do | 1,126.50 | 33.42 | 39 | do do |
| Mooibloem ... | do | 683.70 | 19.20 | 30 | do do |
| Dapple ... | do | 841.50 | 27.09 | 30 | A. T. Holland, Chatsworth |
| No. 1 ... | Grade Shorthorn | 741.50 | 25.50 | 30 | D. Jarvis, Gwelo |
| Barbara I. ... | Grade Friesland | 2,213.30 | 56.43 | 60 | F. B. Morrisby, Gwelo |
| Freezia ... | do | 3,581.20 | 112.97 | 120 | do do |
| Youth ... | do | 2,261.00 | 70.48 | 90 | do do |
| Daffodil ... | do | 1,698.10 | 52.78 | 60 | do do |
| Redbank No. 165 | Grade Shorthorn | 974.50 | 32.35 | 30 | Roberts & Letts, Heany |
| Whinburn Linnet | Grade Friesland | 4,068.00 | 108.88 | 90 | R. R. Sharp, Redbank |
| Whinburn Buttercup | do | 3,326.50 | 109.72 | 90 | do do |
| Whinburn Butterfly | do | 2,639.00 | 71.67 | 90 | do do |
| Whinburn Sidi | do | 2,451.50 | 71.73 | 90 | do do |
| Whinburn Blackbird | do | 3,909.50 | 124.60 | 120 | do do |
| Hetta ... | do | 594.00 | 18.77 | 30 | J. Struthers, Sinoia |
| Gwebi Sunshine | do | 2,191.00 | 69.91 | 90 | Govt. Farm, Gwebi |
| Gwebi Algie ... | do | 1,205.00 | 36.08 | 60 | do do |
| Gwebi Janie ... | do | 903.50 | 32.97 | 30 | do do |
| Gwebi Polly ... | do | 427.50 | 15.26 | 30 | do do |
| Gwebi Mabel ... | do | 804.50 | 31.45 | 30 | do do |

## RHODESIAN MILK RECORDS (continued).

### *Unofficial Milk Records.*

| Name of cow. | Breed. | Milk in lbs. to date. | Butter fat in lbs. to date. | No. of days. | Name and address of owner. |
|---|---|---|---|---|---|
| Astralia ... | Friesland | 6,171.70 | ... | 298 | W. R. Blackwell, Norton |
| Ogden Hall Alberta | do | 8,990.30 | ... | 288 | do do |
| Dunoran Pearl | do | 9,390.70 | ... | 258 | do do |
| Edwinton I. ... | Grade Friesland | 1,541.40 | ... | 60 | Harley & Son, Syringa |
| Edwinton II. ... | do | 1,403.11 | ... | 60 | do do |
| Edwinton IX. | do | 681.18 | ... | 30 | do do |
| De Grendel Froukje | Friesland | 5,461.00 | 144.30 | 150 | Government Farm, Gwebi |
| De Grendel de Hoop | do | 6,233.50 | 191.17 | 180 | do do |
| Melrose Hetta... | do | 11,319.50 | 375.21 | 240 | do do |
| Mimosa Stienser | do | 5,065.00 | 166.99 | 210 | do do |
| Mimosa Clara X. | do | 19,857.00 | 604.93 | 420 | do do |
| Mimosa Pel Fancy | do | 5,283.00 | 163.09 | 150 | do do |
| Mimosa Pel Fancy II. | do | 5,438.50 | 219.38 | 180 | do do |
| Mimosa Clara II. | do | 4,905.50 | 164.61 | 150 | do do |
| Royal Tilford ... | do | 3,537.00 | 104.45 | 120 | do do |
| Gwebi Gay ... | Grade Friesland | 6,269.50 | 225.24 | 255 | do do |
| Gwebi Princess | do | 6,513.00 | 206.76 | 240 | do do |
| Kleinbloem ... | do | 6,809.00 | 215.73 | 210 | do do |
| Gwebi Kleinbloem | do | 6,301.00 | 187.47 | 210 | do do |
| Waterbloem ... | do | 13,053.75 | 385.84 | 311 | do do |
| Gwebi Lucy ... | do | 6,058.00 | 180.08 | 180 | do do |
| Isa ... | do | 10,878.00 | 352.95 | 280 | do do |
| Fanny ... | do | 9,864.50 | 332.81 | 240 | do do |
| Lucy ... | do | 5,635.50 | 169.30 | 204 | do do |
| Hannah ... | do | 8,749.50 | 250.04 | 180 | do do |
| Black Bess ... | do | 2,633.00 | 105.85 | 120 | do do |

# Farming Calendar.

## November.

### BEE-KEEPING.

Now that the first honey flow is on, be sure the hives stand level, whether working them for extracted or section honey. This is important, saving annoyance when preparing the product for market. Occasionally, where bees have not been thoroughly subdued, they object to the removal of honey; postpone the operation for 24 hours. Where increase of stocks is required, artificial swarms can now be made. Use care in storing honey.

### CITRUS FRUITS.

If no appreciable rain has fallen, irrigation must be resorted to in order to keep the trees in good growth and to prevent any check to fruit development.

This is a good month to plant green crops. Sunn hemp is possibly the best crop to smother weed growth and supply humus-forming material after it is ploughed in.

If not already done, storm drains should be made on the sloping ground to prevent erosion of the surface soil during heavy storms.

Where new plantings are contemplated, the holes should be dug and everything got in readiness for planting if the trees are ready for lifting in the nurseries.

All unthrifty trees could with advantage have an additional amount of fertiliser and manure applied during the month. Keep down all water shoots.

### CROPS.

Take note when the first rains fall, and see what leaks there are, if any, in the farm buildings. Do not neglect to effect such repairs as are necessary. Early in the month see that the planters are in perfect order, and that they drop the different seeds to be planted evenly and at the right distance. Try them out on the farm road. Hasten the work of getting the lands for early sown crops into as good a condition for seeding as possible, so that the first and most favourable opportunity for planting may be seized. The young plants make more rapid growth in a good seed bed. Utilise exceptionally early rains for this purpose rather than for planting. The holes for check-row planting of maize can continue to be prepared until sufficient rain has fallen to allow of planting. Velvet beans and dolichos beans for seed or hay may be planted dry if the land is in good order. With favourable weather, planting of maize, velvet and dolichos beans and cotton will commence about the middle of the month, and will continue as the condition of the land and the rainfall permit. Main crop potatoes should be planted from now on to January. Dhal may be planted for seed or green manuring—if for seed, a frost free situation is necessary. Kaffir corn for seed may be planted this month. Green-manure crops requiring a long growing season should be

planted. Destroy, by feeding or burning, early planted trap crop of maize or volunteer plants which have become infested with stalk-borer.

If weeds are beginning to show, keep the harrows going in front of the planters. If weeds are too advanced to be killed by drag harrows and too numerous to be dealt with by hand labour, use the disc harrow or lightly re-plough the land. If the tilth is good, do not be afraid to harrow the young maize. This will save much labour later on by destroying the weeds while they are small.

## DAIRYING.

In a normal year veld grazing should be plentiful in November, and the feeding of dairy stock is then very much simplified; veld grass in a green and succulent condition is practically all that is required for animals of less than average production. Heavy milking cows, however, on early pasture, require extra feed in the form of concentrates, while the latter should always be fed to dairy stock which are in poor condition at this time of the year. Young calves should not be turned out to graze with the herd, and in wet weather are best kept in a clean, dry, airy pen. Weaned stock, which have not hitherto had access to green pasture, should be gradually accustomed to the change in diet and may at first be turned out to graze for short periods. Young stock on pasture should also receive a small daily allowance of concentrates.

Farmers supplying cream to the creamery should adjust the cream screw to the separator so that the latter will separate a cream testing 45 to 50 per cent. butter fat. Cream of this consistency will keep better than thinner cream. It should be borne in mind that it is practically impossible to produce first-grade cream if the cattle are milked in a muddy kraal. In the absence of a cow shed, every endeavour should be made to erect a small milking shed in which four or five cows can be tied, milked and fed. A small shed of this kind is also essential to obtain clean milk for cheese-making. Milking in a muddy kraal invariably results in a gassy, bitter cheese being produced.

The shelves of the cheese room should be scrubbed with boiling water and soda, and for the last rinsing a weak solution of formalin may be used. This should prove effective in controlling cheese pests.

## DECIDUOUS FRUITS.

Continue thinning out fruit on the trees if a very heavy setting has occurred. A small amount of large-sized fruit is preferable to a large crop of small fruit. Thin down the inner growth of new shoots if they have a tendency to crowd each other, and stop all suckers and main stem growths as they appear.

## ENTOMOLOGICAL.

**Maize.**—Crops planted before the last week in this month are liable to suffer later from stalk borer. At Salisbury, crops planted after 27th November have escaped serious injury, but early December plantings are probably the safest. Volunteer maize is commonly badly infested and should be cut out and removed immediately, otherwise the borers tend to spread to surrounding plants. If rain has fallen sufficiently early, lands may be baited at the end of the month against surface beetles, snout beetles and other pests which tend to reduce the primary stand of plants. The formula is arsenite of soda 1 lb., cheapest sugar 8 lbs., or molasses 1 gallon, water 10 gallons. Dip chopped Napier fodder or other green stuff and distribute broadcast. The poison may be sprayed over volunteer maize and weeds on land with good effect. Cutworms do not usually appear in numbers until December, except in low-lying land. Succulent green stuff soaked in a 2 per cent. solution of sodium fluoride is the most recent formula for poisoned bait, but destruction of these pests is difficult. Keep the land clear of weeds as a preventive measure.

If the young plants are attacked by the black maize beetle (heteronychus), the only remedy is to destroy by hand. Good, clean farming will control these pests to a large extent.

**Tobacco.**—This crop is subject to many pests in its early stages, although attacked by a few after vigorous growth has started. Keep cheese cloth covers on seed beds at night to exclude pests, and spray regularly with arsenate of lead (powder) 1 lb. in 30 gallons of water to protect against leaf-eating insects, etc. Lands may be baited against surface beetles with maize bran moistened with arsenate of soda 1 lb. in 30 gallons of water. Distribute in balls about the size of a golf ball and cover over with branches or anything to protect from sun. Place one ball to each ten plants and moisten again when dry.

**Potato.**—The first brood of leaf-eating ladybirds appear in November. Spray with arsenate of lead (powder) 1 lb. in 30 gallons of water. Spraying is also useful against the black blister beetles, which sometimes attack the crop on sandy soils. Keep the soil of irrigated crops well hilled and in friable condition as a precaution against tuber moth laying eggs on the tubers.

**Kitchen Garden.**—Plants of the cabbage family are liable to attack by diamond-back moth and other leaf-eating insects. When considered desirable, young plants may be dusted lightly with arsenate of lead (powder). Cabbage aphis may be kept in check by liberal watering and frequent washing with a forceful stream of water from a hose pipe or spray pump. Drenching the plants regularly with cold water is also held to be a good remedy for the diamond-back moth mentioned above.

**Deciduous Fruits.**—Young trees may need spraying with arsenate of lead (powder) 1 lb. in 20 gallons of water as a protection against chafer beetles, whose attack may check the growth very seriously. Choice varieties of early peaches may be netted to protect them from fruit-piercing moths.

**When in doubt as to the identity of any pest or the method of dealing with it, apply promptly to the Chief Entomologist, Salisbury, bringing or sending specimens of the insects concerned. Note, however, that it is sometimes feasible to prevent injury from pests for which no practical remedy is known. Farmers should therefore endeavour to obtain some knowledge of the pests of the crops they are growing through the articles published in this Journal.**

## FLOWER GARDEN.

All seeds may now be planted. Annuals for January flowering should be sown, amongst which the following will be found to do excellently in this country:—Balsam, Calliopsis, Centurias, Chrysanthemum, Dianthus, Escholtzia, Marigold, Mignonette, Gallardia, Phlox, Poppy, Nasturtium, Nigella, Verbena and Zinnia. These are all hardy, and may be sown in the open either in beds or in the position desired for flowering. Advantage should be taken of each shower of rain during this month to keep the soil well worked and loose.

## VEGETABLE GARDEN.

All vegetable seeds may be sown during this month. Tomatoes and early peas and beans should be staked. The soil should be kept loose and free from weeds, which now get troublesome. Sow pumpkin, mealies, peas and potatoes.

## FORESTRY.

Sowings of eucalypt (gum) seed should be made for late planting. If fresh seed of cedrela toona is available, sowings should be made. Keep the seed beds moist and free from weeds. The tap roots of early seedlings may be cut back in order to form hardy, stocky plants most suited for planting. Continue with pricking out if transplants are to be used.. Pre-

pare all land to be planted by cross-ploughing and harrowing. A well prepared soil is a good fertiliser; it assists establishment and reduces failures

## POULTRY.

Some birds will now be commencing to moult. This will cause a decrease in the number of eggs laid. The poultry keeper, therefore, should see that his birds come through the moult as quickly as possible. Some birds will lay and moult simultaneously, but these are the strongest, most vigorous and the best layers; the majority do not. The process of moulting is a natural one, but it is a severe strain on the system. Fowls that are not too fat, and can stand extra feed at the commencement of the moult, come through it best. More green and animal food should be given, and the utmost care taken that they are not exposed to cold or wet, otherwise they will not only take longer to moult, but go off in condition. A little linseed stewed, or linseed meal, or ground nut meal and milk should also be given. There will next month be a demand for table birds, and such as the poultry keeper intends to sell should be selected. In making this selection, it is no use choosing old or scraggy birds, for it is hopeless to attempt to fatten these, or make them good table birds. Do not coop them up till a fortnight or so before they are to be sold; give them free range and feed them well, with at least one feed of soft food mixed with milk once a day. Turkeys destined for the Christmas market should have free range, but also a feed of soft food once a day, and a good feed of mealies in the evening.

## STOCK.

Cattle.—Normally rains should have fallen and the veld should be plentiful now. Beyond careful dipping, ranchers should not have much worry. If the season is bad, the poorer cattle should be drafted out and given a little hay, ensilage or mealies daily. Dairymen will not require to feed much succulent food, and usually the more expensive protein foods may be considerably curtailed at this time, but good sweet hay and mealies will be found to be very beneficial to milch cows, even if the veld is very plentiful. Clean dry sleeping places for both cows and calves will pay handsomely for any extra trouble involved. Young calves do not need to walk far, and in wet weather are much best in a clean dry pen. Watch for ticks.

Sheep.—Keep the sheep on high dry land. Be careful to keep the ticks down. Be sure the kraal or sheep shed is dry and clean, and that there is shelter from the rain for young lambs.

## TOBACCO.

Continue to sow seed beds, watering, etc. When early beds become overgrown and hard, pull out, dig up and re-sow. Begin transplanting with the first good rains, and continue as fast as the rains and planters will allow, until the crop is set out.

Be careful to fill in the misses from previous transplanting before starting on new fields; use the stoutest and best plants for filling in, and try to get the tobacco from any one field to grow and come to maturity as near at the same time as possible. Discontinue filling in when the field has been planted for several weeks, and has made a good start to grow, as the later filled in plants will be choked out by the earlier ones, and will not come to maturity. Cultivate fields as soon as plants are established, to keep down weeds.

## VETERINARY.

Early heavy rains might bring on horse-sickness before its usual time, but as a rule it need not be feared till the first rains are over in December.

## WEATHER.

The rains should be commencing, if not already begun; occasionally they have delayed until December, and even later, before setting in properly. Between spells of wet weather lasting several days, fine dry

periods occur, at first clear, but later cloudy and thundery, gradually gathering to burst in thunderstorms. The mornings are generally fine, and rain falls chiefly in the afternoon or evening. Heavy downpours are to be expected, and should be provided against beforehand by means of ditches and embankments, and by clearing water ways and furrows.

In a normal season the rainfall varies from two-and-a-half to three inches in Matabeleland, and from three-and-a-half to four inches in Mashonaland generally, with the exception of the eastern border, where it amounts to five inches.

Between the rain periods and prior to the commencement of the rains, severe heat is likely to be experienced.

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# December.

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## BEE-KEEPING.

With a normal season the first or main honey-flow of the year should now be over and the honey ready to be robbed. Before doing this, see that all or the main portion of the frames are capped and sealed, otherwise there will be trouble later on by fermentation. There is nothing on the market to equal the Porter bee-escape board to clear out the bees from the crate, but be sure and see that the board in question is placed the right side up under the crate; failure to do this (and in the hurry of the minute it can easily be so done) will result in the probable suffocation of the bees and the loss of the honey, to say nothing of the chances of robbing from any close-by hives. Replace the empty combs and frames as soon as possible on the hives, to be cleaned up and mended where necessary, and for future storage of more honey. During the very hot spells watch the hives and provide extra ventilation, by inserting small metal wedges between the crates, just wide enough to allow air in, but not a bee under any consideration. Keep all water tins under the hive-stand legs full of water, and see that water is available for the worker bee, which drinks a good deal. When extracting honey, do so in a bee-tight room or verandah, otherwise the operator may have a lot of trouble from other colonies, which quickly find where honey is. Always have one or more crates of shallow frames ready with foundation fixed to place on hives as the season may warrant; such will mean always something for the bees to work at, and during the last flow they may be invaluable to store any such catch crop of nectar, as from tobacco, etc., when the natural flora is finished.

## CITRUS FRUITS.

This is a good month to plant citrus trees into their permanent positions. They should on no account be planted deeper than they stood in the nursery. Water each tree immediately after planting it to settle the soil, then loosen the surface when sufficiently dry to check weed growth and restrict evaporation; continue loosening the surface soil after each rain or watering.

If good rains have fallen, disc the grove in two directions, then sow the cover crop and harrow also in two directions. If the grove is weedy it should receive a shallow ploughing in place of the discing. Then sow the seed and harrow the soil.

All bearing trees must be kept well watered if the weather continues to remain dry. Trees that suffer for want of moisture while the young fruit crop is developing will be adversely affected, and the crop—if any—will be of inferior quality.

Continue to rub off all water shoots or suckers which develop on the tree stems.

## CROPS.

Keep the cultivators going, both on planted and unplanted lands, whenever weather conditions are favourable. Destroy the weeds while young and before they obtain a firm root-hold.

Continue planting maize, cotton, beans and ground-nuts as early as possible this month, followed by sunflowers, Sudan grass, manna, pumpkins and cattle melons.

Linseed, cowpeas, teff grass, oats, sunn hemp, should be planted after the other crops are in.

Ensilage crops may be sown at the end of the month.

When harrowing maize after planting, this work should be done in the heat of the day when the young plants are flaccid and not easily broken.

On lands not yet planted the crop of weeds should be kept down by disc-harrowing.

It is a good plan to harrow or disc-harrow immediately before the planter, or alternatively to follow the planter with a light harrow.

Treat seed oats for smut before sowing. Use one pint of formalin to 25 gallons of water and steep the bag of seed for ten minutes.

Earth up early planted potatoes.

Keep a look out for the stalk-borer and top or otherwise treat affected plants.

New lands and old pastures may be broken, as circumstances permit, during December, January and early February, and again ploughed in from May to July. If they carry a heavy crop of grass it should be cut or burnt to enable good clean ploughing to be done.

Sweet potato slips should be planted early in this month. Do not fail to have in a few acres of this valuable crop.

## DAIRYING.

During the months of December and January veld grazing is usually plentiful, and very little extra feed in the form of concentrates is required for dairy stock. It should be borne in mind, however, that heavy milking cows are unable to satisfy their requirements for milk production from veld grazing alone, and should receive a daily allowance of grain; the latter should be fed at the rate of 2 lbs. for every gallon of milk produced daily, i.e., a cow producing three gallons of milk should receive 6 to 7 lbs. of concentrates. An excellent mixture for this purpose is one consisting of four parts maize meal and one part ground-nut cake.

During wet weather, the provision of a clean dry shelter for calves is essential; the latter should not be crowded together in a small, damp, badly ventilated pen or muddy kraal. When treated in this manner, a calf is very liable to contract various ailments such as scour, etc. Scour is entirely preventable, and is usually caused by over feeding, or feeding from dirty pails, feed boxes, etc. Calves which contract scour should be isolated, the milk ration reduced, and they should be dosed with a few tablespoonfuls of castor oil.

Under the weather conditions which now obtain, cream should be despatched to the creamery at least three times a week. It is of the greatest importance that cream should be cooled immediately after separation, and should be kept cool while on the farm and whilst in transit to the railway station or siding. While the cream is being cooled, it should be frequently stirred, using a stirrer with a plunger attachment. Warm, freshly separated cream should not be mixed with old cream which has already

been cooled. Cool the fresh cream first and then mix thoroughly with the old cream. Gassiness is a common defect in the cream received at the creameries at this time of the year, and is caused by gas-producing organisms with which the milk and cream are contaminated. These organisms abound in mud, manure, etc., and develop and multiply very rapidly at high temperatures. Any precautions therefore which may be taken to eliminate dirt, manure, etc., from the milk and to keep the cream cool will prevent the development of gassiness.

As the night temperatures are fairly high, cheese-makers should not attempt to use night's milk for cheese-making; morning's milk plus a starter will give the best results. Gouda cheese-making operations are not usually successful at this season of the year, owing to the poor quality of the milk and the prevalence of gassiness. This type of cheese is best manufactured during March and subsequent months.

## DECIDUOUS FRUITS.

Cover crops may be planted when the rains commence, as recommended under citrus fruits.

Summer pruning may be commenced this month. If all undesirable shoots are taken out of the trees, the remaining shoots will receive sufficient air and light to mature.

Ripening fruit must be carefully harvested, graded and packed if satisfactory prices are to be secured. Do not gather any fruit when it is wet.

Keep all recently planted trees in good condition; the first year's growth is the most important. If the undesired shoots are rubbed off when they first appear, the retained shoots will receive all the nourishment and the tree will then grow to a large size.

## ENTOMOLOGICAL.

Maize.—The first half of this month appears to be the best period during which to plant maize for the avoidance of stalk borer attack—at least in the Salisbury district. Hoe out and remove volunteer maize plants before the new crop is up, as they are liable to be infested with borer, which tends to spread to surrounding plants. Red soils may be baited with chopped Napier fodder or other suitable greenstuff dipped in arsenite of soda 1 lb., cheapest sugar 8 lbs. or molasses 1 gallon, water 10 gallons, to destroy surface beetles, snout beetles and other insects which may affect the primary stand.

Tobacco.—The enemies of this crop are in general most active during December, whilst the crop is still in the early stages of growth.

For information regarding tobacco pests, see "Rhodesia Agricultural Journal," January, 1928, or Bulletin No. 665.

In general, poisoned baits may be used against surface beetles, grasshoppers, crickets and cutworms. Against surface beetles, arsenite of soda 1 lb. in 30 gallons of water used to moisten maize bran is a good bait. Against grasshoppers and crickets the addition of 8 lbs. sugar or 1 gallon molasses to each 1 lb. of arsenite of soda is recommended. Spray with arsenate of lead (powder) 1 lb. in 30 gallons of water against leaf-eating insects and as a protection against leaf miners and stem borer. Transplants may be dipped head downwards as far as the roots in the poison. Discard seedlings infested with stem borer and root gallworm.

Cutworms.—Keep ground around seed beds as free as possible from vegetation, to prevent female moths from laying eggs there. From the time the plants show foliage of the size of a sixpence they should be sprayed weekly with arsenate of lead (powder) 1 lb. to 30 gallons of water. This should prevent cutworms developing in the beds, as the young cutworms attack the leaves of the seedlings, and so ingest the poison.

House Flies.—With the coming of hot weather and the rains, house flies greatly increase, and should be kept out of dwelling houses by mosquito netting, or poisoned in the following way:—Dissolve 1 lb. of sodium arsenite in 10 gallons of water, and add about 10 lbs. of cheap sugar (2 gallons of treacle) or other sweet substance. The mixture should be sprayed upon branches of shrubs or trees, which may be hung up in convenient places where flies congregate. These insects are attracted to the bait, and are easily poisoned.

Mosquitoes, Stable Flies.—Destroy breeding places around homestead. Poison or trap adults.

Potatoes.—Ladybirds and caterpillars may be injurious to the foliage, and on sandy soils blue blister beetles sometimes cause damage. Spray with arsenate of lead (powder) 1 lb. to 25 gallons of water.

Kitchen Garden.—Marrows, etc., are commonly attacked by leaf-eating beetles. Spray with arsenate of lead (powder) 1 lb. in 25 gallons water, plus 8 lbs. cheapest sugar or 1 gallon molasses. Dusting lightly with pure arsenate of lead powder should give protection. Young plants of the cabbage family may be dusted with pure arsenate of lead powder or with such powder mixed with up to six or eight parts of finely sifted, thoroughly slaked lime as a protection against leaf-eating insects.

Fruit Trees.—The regular collection and destruction of fruit beetles may be necessary. Choice varieties of peaches, etc., may be netted as a protection against pests.

## FLOWER GARDEN.

This month is generally showery, and constant stirring of the soil is, therefore, necessary to keep it loose. Seeds of perennials and annuals for February blooms may be sown. Transplanting should be done in the evening or on a cloudy day. Carnations should be kept free from dead wood, and climbers attended to.

## VEGETABLE GARDEN.

All vegetable seeds may be planted. All advanced plants should be constantly cultivated. Potatoes should be ridged, and peas, beans and tomatoes staked. This is a good month for planting the main crop of potatoes.

## FORESTRY.

Final preparations for planting should be made, including harrowing or pitting. Early plantings may be carried out if the season is a good one. Planting should be carried out on dull, rainy days, or failing such days, late in the afternoons. Great care should be exercised in planting out to avoid bending the tap root, and to set the trees in the ground at the same level as they were in the seed bed or tray. Late sowings of Cedrela toona seed may be made.

## POULTRY.

The poultry keeper should take precautions whereby the wet weather will not affect his birds' health and their laying powers. All houses must be absolutely watertight, the floor raised well above the level of the surrounding ground, thus preventing water seeping in and making it damp. The birds themselves should not get wet, and no pools of water should be seen in the runs. Foodstuffs also must be kept absolutely dry.

Many birds will at present be moulting; these require special treatment to bring them through it quickly, and if possible keep them in lay during the period. A pamphlet on this can be obtained from the Poultry Expert, Department of Agriculture. This lack of attention to the birds during the moult is one of the causes of the scarcity of eggs at this season. There is no need for it if poultry keepers would only look after their birds properly.

Those who intend disposing of their turkeys for killing at Christmas must avoid cooping them up, as is done when fattening fowls, for they immediately mope and go off their food. Give them free range, and in addition to their usual evening feed of maize, during the first week of December give one of wheat or maize in the morning, and during the second and third weeks three meals a day, each one containing, in addition to wheat or maize, some crushed monkey nuts or sunflower seeds. Plenty of thick milk and chopped-up onions or onion tops should also be given.

Those who go in for ducks should feed well and get as many to marketable size as possible by Christmas, when they usually fetch good prices. They should be kept in a small run; nearly all their food should be wet mash, bran, pollard, maize meal, meat meal and milk, as much as they will eat three times a day, i.e., they should practically be allowed to spend their existence eating and sleeping. Big duck breeders often give a fourth meal by lamplight at 10 p.m., and the first meal is given at sunrise.

## STOCK.

Cattle.—Ranching cattle should not require any attention beyond dipping, but any stock that are in weak condition will be the better for a little hay or a pound or two of maize at night until they have regained strength. The bulls should be returned to the herd either at the end of the month or in January, and it should be remembered that the better they are conditioned and fitted for their work the more hope there is of a good crop of calves. For this reason also every effort should be made to have all the female stock in strong condition. Dairymen will find that as the grass becomes lush and rank a supply of sweet veld hay, teff hay or, say, three pounds of crushed maize given in the sheds at night will enhance both the quality and quantity of the milk. This will be found to be the case more particularly in districts of heavy rainfall. Milch cows should be protected as much as possible from cold rains and hot sun. Yarding all night in a clean kraal provided with a simple lean-to shed well bedded up will be found to be very beneficial in seasons of protracted rainfall. The calf pen should be kept clean, dry and sweet, and young calves will be better kept in during very hot or very wet weather. Dipping should be regularly attended to.

Sheep.—Graze on the higher lands, keeping the kraals clean, dry and airy, and watch for ticks.

## TOBACCO.

Continue preparation of land. The best results are obtained by transplanting on freshly prepared soil. Transplanting should be pushed on with as fast as transplants and climatic conditions will allow. As soon as plants begin to grow, go over the field and fill in all missing hills with strong selected plants, and then apply fertiliser to hasten growth and ensure early maturity. Cultivation should be commenced as soon as the plants start growing, especially on sandy soils. The crust caused by heavy rains should be pulverised through cultivation as soon as the surface soil is dry enough for tillage; this gives the young plants the benefit of the moisture stored in the soil. Do not neglect the late sown seed beds. Make every effort to finish transplanting before the end of the month, so that the crop will be harvested before dry, cool weather begins.

## VETERINARY.

Occasional cases of horse-sickness may occur during this month. With the great increase in ticks, due to the heat and moisture, cases of redwater and gall-sickness may be expected, more especially amongst Colonial stock imported since the last rainy season. The cool weather which frequently follows the early rains is an excellent time for castrating calves and other animals.

## WEATHER.

In Mashonaland the rainfall during this month varies from eight inches along the eastern border to six inches in the west. In Matabeleland it

varies from five-and-a-half inches in the west to four-and-a-half inches in the south. Considerable divergencies from these normals may occur in individual seasons, but on the whole this month is the most regular in its behaviour. Very heavy downpours may be looked for, and it is well to be provided by drains and ditches against the effects of very heavy rain storms. A dry spell about Christmas time is a very frequent, though not invariable, event in Rhodesia. This partial drought may last only a fortnight, or may extend to six weeks, in the latter event often causing some anxiety regarding young crops, especially those not yet through the ground. The best means of meeting this condition of the weather is by frequent surface cultivation by harrow or horse hoe to preserve a loose soil mulch on the surface and prevent losses of soil moisture by evaporation.

# Notes from the "Gazette."

| *"Gazette" Date.* | *Items.* |
|---|---|
| | IRRIGATION BRANCH. |
| 20.9.29. | Government Notice No. 546 of 1929 publishes the regulations for the hire of Government drills for water boring, etc. |
| | AFRICAN COAST FEVER. |
| 20.9.29. | Government Notice No. 486 of 1929 is cancelled and the following are declared areas of infection and guard areas in lieu thereof :— |

Native District of Mazoe.

(a) Areas of Infection.

(1) The southern portion of the farm Richlands.
(2) The farms Grey and Mari Plumbi (Nos. 40 and 41, Glendale).
(3) The farms Verona, Sweet Valley, Limbeck (Nos. 39, 31, 26 and 38, Glendale), Glen Grey and Umzi, including Glendale station.
(4) That portion of the Chiweshe Reserve lying south of the Ruia River.
(5) The farms Skye, Tekke and Banff.
(6) The farm Mazambo.
(7) The farm Makori.

(b) Guard Areas.

(1) That portion of the Chiweshe Reserve lying north of the Ruia River.
(2) The farms Frogmore, Frogmore Extension, Hassa and Arda.
(3) The farms Dunaverty, Dundry, Chomfuti and Brockley.
(4) An area bounded by and including Duntarvie, Dunmaglas, Irenedale, Longcroft, Hillymead, farms Nos. 28 and 27, Sussex, farms Nos. 1 and 2, Laurencedale, Georgia, Bretton, Granite, farms Nos. 20 and 19 and Roan Flats.

| "*Gazette*" *Date.* | *Items.* |
|---|---|
| | AFRICAN COAST FEVER. |
| | Melsetter Native District. |
| 27.9.29. | Republishing with corrections Government Notice No. 441 of 26th July, 1929, adding Wolfscrag to the area of infection and Vermont, Wolverhampton, Helvetia, Chibuzana, Ratelshoek, Smithfield and Flenters to the guard area. |
| | "PRODUCE EXPORT ORDINANCE, 1921." |
| 4.10.29. | Government Notice No. 577 of 1929 notifies the appointment of the following inspectors :—<br>A. V. C. F. Hubbard, from 1.7.29.<br>R. M. M. Penman, from 1.8.29.<br>L. H. Stokes, from 1.8.29.<br>G. D. Corser, from 15.8.29. |
| | POUND. |
| 4.10.29. | Government Notice No. 578 of 1929 notifies the establishment of a pound on Inyanga Valley Farm, Inyanga. |
| | "GAME LAW CONSOLIDATION ORDINANCE, 1906." |
| 18.10.29. | Cancelling Government Notice No. 351 of 1929 and suspending the operations of sections 9, 10 and 12 of the aforesaid Ordinance until further notice in respect of game of all classes, with the exception of game birds, in the area defined in the Bubi and Wankie districts. |
| | POUND. |
| 18.10.29. | Government Notice No. 607 of 1929 notifies the abolition of the pound on Pagati Farm and the establishment of a pound on Alali Farm, Matobo district, from 15th October, 1929. |
| | POULTRY EXPERT. |
| 18.10.29. | Government Notice No. 608 of 1929 notifies the appointment of H. G. Wheeldon, Esquire, as Poultry Expert from 1st October, 1929. |
| | "MAIZE ACT, 1925." |
| 18.10.29. | Government Notice No. 616 of 1929 notifies the receipt of a petition for the application of the provisions of the "Maize Act, 1925," to an area in the Hartley district, in which the growing of any but white dent maize is prohibited, and calling for objections, if any, to the petition being acceded to. |
| | "ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904." |
| 18.10.29. | Government Notice No. 623 of 1929, cancelling Government Notice No. 255 of 1919 and prescribing fresh regulations for the treatment of bones and their products, also a penalty for their contravention. |
| | AFRICAN COAST FEVER. |
| 18.10.29. | Government Notice No. 624 of 1929 cancels Government Notice No. 726 of 1928, declaring an area of infection in the Bikita native district. |

# Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

## AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 533. Silage: Its Composition and Value as a Farm Food, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.
No. 684. Warning to Maize Growers: Maize for Export.
No. 685. Notes on Farm Practices at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Orrdinance" during the year 1927-28.
No. 700. Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.
No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.
No. 743. Sunn Hemp, by S. D. Timson, M.C., Dip.Agric.
No. 750. Cotton in Southern Rhodesia—Hints to Growers, by G. S. Cameron, Empire Cotton Growing Corporation.
No. 751. The Sweet Potato, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 757. Maize on the Sand Veld: Results at the Tobacco Experiment Station, Salisbury, by C. A. Kelsey-Harvey, Manager.
Botanical Specimens for Identification.
Maize Grading Regulations.
Accelerating the Sprouting of Potatoes.

## REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.
No. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.
No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.
No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy. F.L.S.

No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.
No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.
No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.
No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.
No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.
No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.
No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H G. Mundy, F.L.S.
No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.
No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.
No. 564. A Maize Rotation Experiment, by A. R. Morkel.
No. 566. Bulawayo Experiment Station, Annual Report for Year 1924-25, by H. G. Mundy, Dip.Agric., F.L.S.
No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.
No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.
No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.
No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.
No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.
No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.
No. 745. Salisbury Agricultural Experiment Station Annual Report, 1927-28, by H. C. Arnold.

## TOBACCO.

No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.
No. 607. Tobacco Seed Beds, by D. D. Brown.
No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.
No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.
No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.
No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.
No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.
No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).
No. 661. Flue-Curing Tobacco Barns, 12 ft. x 12 ft. x 16 ft., by B. G. Gundry.
No. 665. Tobacco Pests of Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.
No. 671. Wildfire and Angular Spot of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.
No. 676. Mosaic Disease of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.

No. 679. Tobacco Culture in Southern Rhodesia: The Harvesting and Curing of Virginia Tobacco, by D. D. Brown.
No. 689. The Lesser Tobacco Wireworms, by Rupert W. Jack, F.E.S.
No. 690. Thermal Efficiency of Tobacco Barns and Furnaces, by C. L. Robertson, B.A., B.Sc., A.M.I.C.E.
No. 692. Frenching of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A
No. 715. Turkish Tobacco Culture in Southern Rhodesia, by D. D. Brown, Chief Tobacco Expert.
No. 718. Preliminary Experiments on the Control of White Mould of Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.
No. 728. Suggested Crop Rotations for Tobacco Growers, by D. D. Brown, Chief Tobacco Expert.
No. 734. Common Faults in Curing Virginia Bright Tobacco, by D. D. Brown, Tobacco and Cotton Expert.
No. 746. The Development of the Tobacco Industry in Southern Rhodesia. A Historical Survey, by D. D. Brown, Chief Tobacco Expert.
No. 748. Frog Eye Disease of Tobacco, by J. C. F. Hopkins, B.Sc.(Lond.), A.I.C.T.A., Chief Botanist and Mycologist.
No. 753. Leaf Spotting of Tobacco caused by Mosaic, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 247. Statistical Returns of Crops Grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and Fred Eyles, F.L.S.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
No. 361. Statistics of Live Stock and Animal Produce for the Year 1919, by F. Eyles, F.L.S.
No. 380. Statistics of Crops Grown by Europeans in Southern Rhodesia, 1919-20, by H. C. K. Fynn.
No. 393. Statistics of Live Stock and Animal Produce for 1920, by H. C. K. Fynn.
No. 409. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1920-21, by H. C. K. Fynn.
No. 426. Statistics of Live Stock and Animal Products for the Year 1921, by H. C. K. Fynn.
No. 443. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1921-22, by F. Eyles, F.L.S., and H. C. K. Fynn.
No. 459. Statistics of Live Stock and Animal Products for the Year 1922, by A. Borradaile Bell.
No. 484. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1922-23, by A. Borradaile Bell.
No. 502. Winter Crops, 1923, by A. Borradaile Bell.
No. 527. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1923-24, by A. Borradaile Bell.
No. 543. Statistics of Live Stock and Animal Products for the Year 1924, by A. Borradaile Bell.

No. 580. Statistics of Summer Crops Grown by Europeans in Southern Rhodesia for the Season 1924-25, by A. Borradaile Bell, Statistician.
No. 595. Statistics of Live Stock and Animal Products for the Year 1925, by A. Borradaile Bell, Statistician.
No. 626. Statistics of Summer Crops grown by Europeans in Southern Rhodesia for the Season 1925-26, by A. Borradaile Bell, Statistician.
No. 646. Statistics of Live Stock and Animal Products for the Year 1926, by A. Borradaile Bell, Statistician.
No. 682. Agricultural Returns for 1926-7 : Preliminary Returns, by Thomas G. Gibson, Government Statistician.

## LIVE STOCK.

No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 336. Butchering and Flaying.
No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.
No. 381. From Breeder to Butcher; Cattle Feeding Experiment No. 8, by Eric A. Nobbs, Ph.D., B.Sc.
No. 421. From Breeder to Butcher; Cattle Feeding Experiment No. 9, Government Experiment Farm, Gwebi, by E. A. Nobbs, Ph.D., B.Sc., F.H.A.S.
No. 446. From Breeder to Butcher; Cattle Feeding Experiment No. 11, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc., F.H.A.S.
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THE RHODESIA

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## Editorial.

*Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.*

**A School of Agriculture for Southern Rhodesia.**—Farmers and everyone interested in the Colony will be gratified to learn that at last the Government's plans for a School of Agriculture at Matopo have fructified and that courses will commence in January next. It is many years since Dr. Eric Nobbs, then Director of Agriculture, first broached this subject, and many have been the difficulties and disappointments experienced in putting his ideas and those of his successors into execution. Agriculture has progressed very materially since those early days, and it has always been a distinct handicap to the Rhodesian youth that he has had no institution in his own Colony where he could receive a training in agricultural science. This handicap is now removed, and we trust the support accorded the school

will justify the expense and preparation entailed in bringing it into being.

We would specially direct attention to the article which Professor C. K. Brain, Acting Secretary for Agriculture, has written for this issue of the Journal, in which he reviews very thoroughly the history of the movement and sets out fully information concerning the school. It will be noted that it is intended to continue the junior school course on lines similar to the present curriculum, leading to the Departmental Junior Leaving Certificate, but stressing the agricultural and rural side of instruction. Then will follow a two years' course in agriculture leading to a diploma in agriculture. The fees for the junior school are £48 per annum, which includes tuition. For the diploma course the fees are £60 per annum, including board and tuition. Short courses for teachers and farmers are contemplated, but these cannot be arranged until the necessary staff is appointed. It is also intended to continue the demonstration, experimental and investigational work which is at present in progress at Matopo Farm. It should be mentioned that applications for entrance to the school must be sent in before the 17th January and that the school opens on the 27th of that month.

The choice of the Matopos as the site of the school is a happy one, for not only are the natural conditions peculiarly suitable for such an institution, but the historic environment must exercise a particular influence in building up the character of the students. The establishment of the school is a signal event in the history of our young Colony, and we feel that it is destined to play a very important part in the development of our great agricultural resources.

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**Water Boring.**—In another portion of the Journal will be found some explanatory notes regarding the conditions under which Government drills are available for farmers. In certain localities advantage has been taken of the easier terms under which these drills are now obtainable, but in others where drills are not at present operating farmers do not appear to be generally acquainted with these conditions.

It should be known that there are at present eight machines employed for private applicants and on Crown land

farms in the following areas:—Nyamandhlovu district, Lower Gwelo district, Lomagundi district to the west of Sinoia, Hartley district in the neighbourhood of Chakari, Darwin district, Marandellas district, Lomagundi district to the north-east of Banket, and in Victoria district to the south-west of Victoria.

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**Great Britain's Dairy Imports.**—We observe from Messrs. Weddel's Annual Review of the Imported Dairy Produce Trade that imports of butter into the United Kingdom (excluding the Irish Free State) for the year 1928 totalled 290,604 tons, which constituted a record. Of this quantity, 108,018 tons came from British Dominions, New Zealand being the chief exporter with 64,896 tons, Australia coming second with 43,121 tons. South Africa exported no butter to the United Kingdom and Canada 1 ton. Of the foreign countries, by far the greatest quantity came from Denmark, which was responsible for 105,162 tons, Russia being the next largest supplier with 18,108 tons and Argentine the third with 17,105 tons. British Dominions supplied the United Kingdom with 85 per cent. of the cheese imported in 1928, the total imports in that year constituting a record. New Zealand holds pride of place, her exports of cheese to Great Britain in the year under review totalling 83,432 tons. Canada sent 43,862 tons and South Africa none. Of the cheese supplied from foreign sources, Holland with 10,549 tons heads the list, Italy coming second with 6,681 tons.

The average prices per cwt. for the various descriptions of butter were as follows:—Danish, 186s. 3d., New Zealand 179s. 4d., Australian 171s. 3d., Argentine 171s. 10d., Siberian 161s. 8d. These levels are 6s. to 9s. per cwt. above the average for the preceding year, except in the case of Danish butter, which was only 2s. 6d. up. Cheese averaged 110s. 9d. per cwt. for Canadian and 99s. 9d. for New Zealand, showing increases of 6s. 9d. and 2s. 10d. per cwt. respectively.

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**Weather Forecasts.**—During the wet season from October to April daily weather forecasts are issued and are telegraphed to all official post offices in Southern Rhodesia.

The forecast may be obtained free of charge on application to the official in charge of the post office. Farmers desiring to obtain the forecast by telephone may arrange with the nearest office; a charge will be made for the call by the Postal Department.

The forecasts consist of two parts. The first is headed Probabilities to Noon, and gives in as great a detail as possible the probable weather for 24 hours. The second section, headed Further Outlook, extends the forecast beyond the 24 hours; in general it refers to the following afternoon, but at times is used to give an indication of approaching weather. The Further Outlook is not as reliable as the 24 hour forecast. The following terms are used with a more definite meaning than the words themselves convey:—

*Isolated Showers.*—Showers recorded at about 10 per cent. of the stations.

*Scattered Showers.*—Showers recorded at about 20 per cent. of the stations.

*Showers Numerous.*—Showers recorded at about 40 per cent. of the stations.

*Showers General and Fairly General.*—Showers recorded at about 60 per cent. of the stations.

*Rain General.*—Rain recorded at nearly all stations; *Rain Fairly General* represents a rather smaller number of stations.

*Showers* represent local rain, that is the distribution may be very uneven from farm to farm in an area; they usually occur when the weather is unsettled and are frequently accompanied by thunder.

*Rain* represents precipitation falling uniformly over an area and is accompanied by continuously overcast skies and thunder is rare.

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**Veterinary Research.**—In our issue for October attention was drawn to the re-appearance of "Notes from the Veterinary Laboratory," and the point of view advanced that nothing but good would ensue from an interchange of experiences between the worker in the laboratory and the man in the field. We are pleased to learn from the Director

of Veterinary Research that, as a result of the publication of the notes, correspondence has ensued which has helped him considerably in the research work he has in hand. In the present issue of the Journal will be found further notes, and we would direct particular attention to the reference to screw worm disease, which at certain times of the year and in certain localities seriously affects the health of cattle. It will be seen that a new method of treating this disease has been devised which, although in the experimental stage, holds out promise of being very effective. Further, that the Director of Veterinary Research invites the collaboration of the practical man in the field to put this method to the test and to advise him of the result.

A considerable portion of the notes now appearing is devoted to a discussion of undulant fever of man and its association with abortion disease in cattle. Reference is made to the danger of contracting undulant fever by contact with infected animals as distinct from the consuming of milk—a danger which stockmen should bear in mind. It is of interest to recall that it was Mr. Bevan who in 1920 first drew attention to the affinity of these two diseases, and we notice that reference to the fact is made in the *Lancet* of 26th October, 1929. Since the close relationship of these diseases was discovered in this Colony, similar discoveries have been made in other parts of the world, and there would appear to be the greatest need for care in handling infected animals, while their milk should most certainly be avoided.

Other subjects dealt with in this month's notes are the influence of phosphorus in the feeding of live stock, factors governing the determination of sex, recommendations of the veterinary section of the Pan-African Agricultural Conference at Pretoria in relation to the control of East Coast Fever, and horse-sickness, all of which are dealt with in an eminently practical manner. We feel sure that stockmen will find these notes of particular interest and value.

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**Apiculture.**—It is surprising that, notwithstanding the natural advantages which exist in Southern Rhodesia for bee-keeping, such as easy acquisition of colonies, a mild climate and a wealth of nectar-producing flora at all seasons of the

year, so little progress has been made in what in other countries is a very extensive and lucrative industry. For instance, in the United States of America alone, statistics show that seventy-five million dollars' worth of honey and three million dollars' worth of beeswax were produced in the year 1923. The reason for the neglect of apiculture in this Colony may be the reputation which the Rhodesian bee has for a truculent disposition, and a hostile swarm should certainly be given a wide berth. The experience of Mr. W. S. Alexander of Woodlands farm, Shamva, however, showed that when he housed his hives in a brick building and under a galvanised iron roof and protected the bees from their natural enemies, they were quite docile, and could at times be handled without veil, gloves or smoker. It would be interesting to have the experience of others who have handled Rhodesian bees, and we hope anyone with the necessary experience will write us hereon.

Mr. Savory told us in one of the articles he wrote for the *Rhodesia Agricultural Journal* that the Rhodesian honey bee is to be found in its wild state in holes in trees, in the ground and in rocks or krantzes. Of the three varieties, the only one he advised the apiarist to handle was the first-named. He describes the Rhodesian bee as a first-rate honey getter, and although slightly smaller than the American or English bee, says it can easily vie with either in the production of honey if properly housed and tended. On another occasion he wrote: "As a honey getter it is doubtful whether there is any race of bee which can excel the ordinary Rhodesian bee." He further tells us that the bee which has its nest in the ground is as a rule not worth handling, while the rock or krantz bee should never be hived, as it is extremely vicious, and is dangerous.

Mr. Savory's opinion of the Rhodesian bee as a first-rate honey getter is shared by Mr. Alexander, who wrote in the *Rhodesia Agricultural Journal* of September, 1926, that "a proper record of the honey taken from the various hives has been kept since November, 1925, and as much as 102 lbs. has been extracted from a single colony, and we have still another extraction to make before the winter sets in." With honey selling to-day in Salisbury at 2s. 9d. per lb. it would appear that bee-keeping offers good prospects to those who undertake

it on approved lines. This price is, however, too high to encourage general consumption, and it would appear that it could be sold at a considerably lower figure and still ensure to the producer a reasonable profit. Rhodesian honey is of excellent quality and is superior to some of the imported article from the Union of South Africa and sold at a higher price.

A great deal has been written in this Journal on the subject of bee-keeping, and practically all the processes have at one time or another been described. We advise readers who may be contemplating taking up apiculture to refer to their Journals for the years 1927 and 1928, wherein Mr. Savory, who is a practical man of wide experience of bee-keeping in Southern and Northern Rhodesia, wrote a series of articles, which were, however, not reprinted in bulletin form.

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**Crop and Live Stock Statistics.**—The report of the Government Statistician on the summer crop returns for the season 1927-28 and the winter crop and live stock returns for 1928 has just been published. The delay in publishing this important data is unfortunate, for their value lies almost entirely in early dissemination. Each year sees the same delay, notwithstanding the efforts made to ensure the prompt rendering of returns. In the year under review the summer returns were due on 30th September, 1928, and yet it was not possible to close the summaries until March, 1929, when, in spite of several reminders, there were still 149 farmers, some of whom had considerable acreages under cultivation, who had failed to render returns. In the case of live stock returns, which were due in January last, belated returns were still trickling through in July last.

The returns show that the yield of maize in the season 1927-28 totalled 1,268,100 bags from 295,290 acres, or an average of 4.29 bags per acre, as compared with 6.20 bags in the previous season. The acreage under maize during the season under review was the greatest on record. The weather conditions in the season 1927-28 were unpropitious, the rainfall being 6 inches below normal, with a long dry spell in February which caused irrevocable damage to crops. The

returns show that maize still holds pride of place in the agricultural economy of the Colony, and that 41.3 per cent. of the crop was grown in the Mazoe district. An analysis of the returns dealt with shows that 2,099 farmers out of a total of 2,912 grow maize. Of these, 238 grew 301 acres and over, 165 grew 201-300 acres, 356 grew 101-200 acres and 1,340 grew 100 acres and under.

The yield of tobacco in the season under review totalled 24,943,044 lbs. from 46,622 acres, averaging 535 lbs. per acre. Of this total, 451,580 lbs. were of Turkish type. The number of tobacco growers increased from 763 to 987, and of this number 162 grew 10 acres and under, 112 grew 11-20 acres, 118 grew 21-30 acres and 68 grew 41-50 acres. There were 50 growers with acreages between 101-200 acres. Other crops figuring in the summer returns are cotton, ground nuts, sunflower, maize for silage, potatoes—of which 41,791 bags were obtained from 1,829 acres—beans and pumpkins.

The area devoted to the raising of winter crops was 7,297 acres, a decrease of 375 acres as compared with the previous year. This is mainly accounted for by the smaller acreage planted to the winter crop of potatoes. The total area occupied by winter potatoes was only 978 acres, or 55 per cent. of that planted in 1927. Apropos of potatoes, the report states: "That farmers are not planting sufficient to meet the local demand and the trade with adjoining territories is evidenced by the figures given below, from which it will be seen that the value of imports amounted to over £20,000. Although a proportion of this is for seed imported from the United Kingdom, over £17,000 worth of potatoes was imported from the Union of South Africa." The principal winter crops grown in this Colony are wheat, oats, barley and potatoes. The production of wheat amounted to 6,887 bags from 3,272 acres. Imports of wheat and wheat products in 1928 were valued at £109,792.

The number of cattle owned by Europeans at the end of December, 1928, was 905,383, and by natives (estimated) was 1,420,913, making a total of 2,326,296, compared with 2,327,089 in 1927. European cattle decreased by 51,139 head, while native-owned cattle increased by 50,346 head. The former are now lesser in numbers than they have been

since 1921, while the latter have shown a steady rise since returns were first collected in 1917. Although the total European-owned cattle in the Colony shows a decrease, it is satisfactory to note that the number classed as pure-bred record an increase of 791 head or 6.5 per cent., compared with an increase of 4.7 per cent. in 1927.

Local consumption of cattle for the year shows a considerable increase, the total being 112,965 head, compared with 91,083 head in 1927. Of the above total, 102,284 were slaughtered by butchers and 10,681 on farms. The total number of deaths reported during the year under review was 57,819, a total death rate of 6.4 per cent., compared with 53,203 in 1927. There were fewer deaths from disease in 1928, the total under this heading being 13,170, compared with 17,664 in 1927. The drought was responsible for the rise in deaths during 1928, the numbers under this heading having risen from 24,683 in 1927 to 34,212 in 1928. Exports of cattle show a considerable increase, the total being 71,429, or 50 per cent. over that of 1927. The total number of cattle owners at the end of 1928 was 2,646, compared with 2,587 in 1927.

# Agricultural Education in Southern Rhodesia.

## THE MATOPO SCHOOL OF AGRICULTURE.

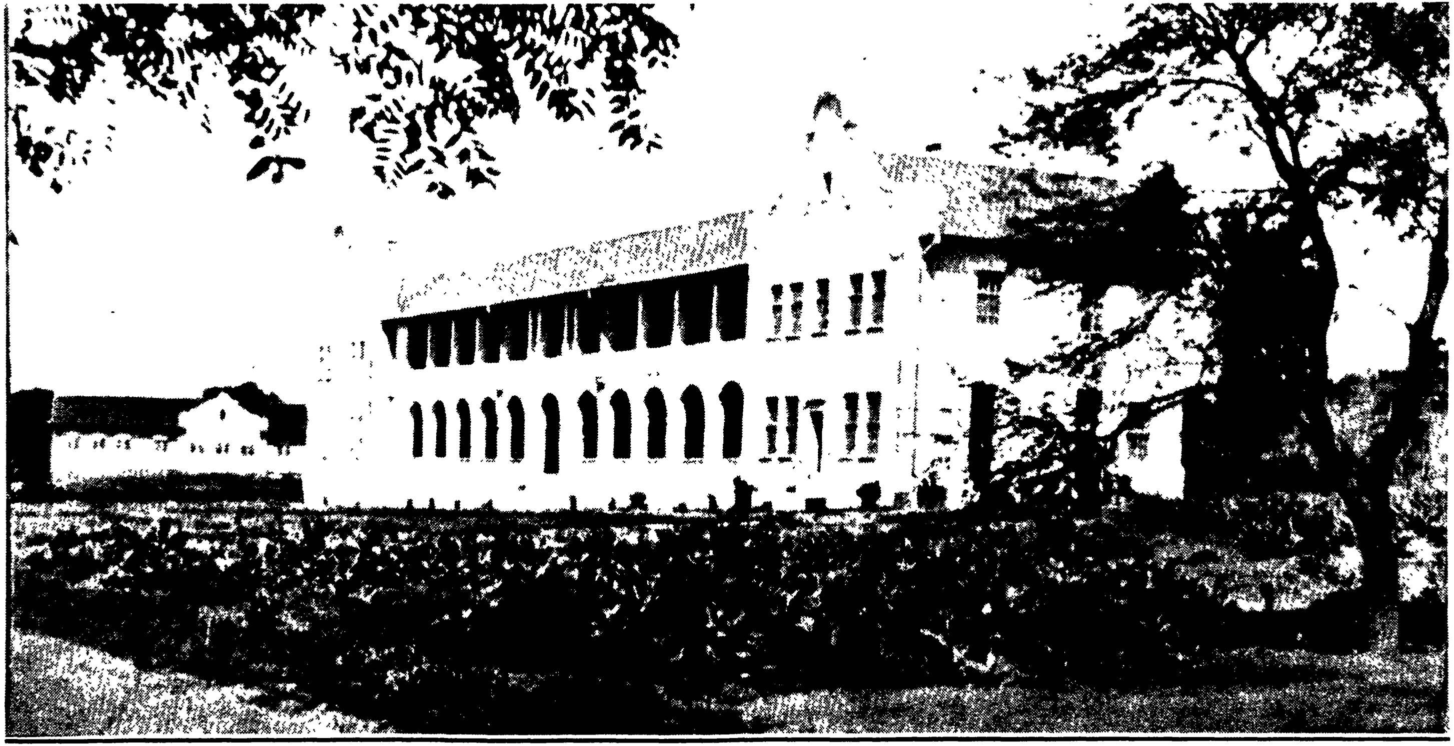
By C. K. BRAIN, M.A., D.Sc.

**Historical.**—In 1896, Cecil John Rhodes purchased approximately one hundred thousand acres extending from the commonage of Bulawayo well into the Matopo Hills, which is now known as the Rhodes Matopo Estate. In the following year he began to elaborate his many schemes for the development of Rhodesia, among which were the planning of experiments in stock rearing and in agriculture at Matopo.

Rhodes realised the vital necessity for the conservation of water, and gave instructions for the immediate construction of the present Matopo Dam. In 1901 we read from a letter he wrote to Sir James McDonald (then Mr. J. G. McDonald) that he was impatient to test the irrigation possibilities at Matopo, and with characteristic attention to detail, ordered that the land be prepared for potatoes and lucerne. Thus during his lifetime Rhodes had started a portion of the Matopo Estate on the way to an experimental and demonstration farm.

The lines along which he desired the estate, or a portion of it, to develop are clearly indicated in his will in the following passage:—

> "For the guidance of my trustees I wish to record that in the cultivation of my said landed properties I include such things as experimental farming, forestry, market and other gardening and fruit farming, irrigation and the teaching of any of those things, and establishing and maintaining an agricultural college."



The hostel, Matopo School of Agriculture.

At the time of Rhodes' death the estate consisted of about 95,700 acres, the larger part being occupied by fifteen farms. The trustees carried on the estate, including the experimental farm, as far as was possible, with the means at their disposal, along the lines laid down by Rhodes, but up to 1913 apparently no steps had been taken towards the formation of an agricultural college.

In an article which appeared in the *Rhodesia Agricultural Journal* of August, 1913, by Dr. Eric Nobbs, the then Director of Agriculture, the writer refers to the fact that the matter of the need for agricultural education was first brought to the notice of the Agricultural Union at its congress in 1909. It is interesting to note from the same article that in opening the farmers' congress at Salisbury, His Honour the Administrator referred to the decision of the Government to undertake the establishment of an agricultural college as soon as circumstances permitted, and that the president, Mr. R. A. Fletcher, welcomed the proposal and emphasised the desirability of training a boy in the environment in which he was going to live.

The board of the British South Africa Company, in response to the general wish of the country for the promotion of agricultural education, came forward with an offer of material assistance for the inauguration of the projected school of agriculture. In his speech at the opening of the Legislative Assembly the Administrator said:—

> "The important position which the farming industry occupies in this Territory has led the Company to the conclusion that it is most desirable to provide at an early date facilities for giving a sound agricultural education to the sons of settlers and to others who may desire to become settlers in the country.
>
> "The Company is prepared to advance the funds required for establishing and equipping an institution for this purpose, on certain conditions which will be submitted for your approval; and further, it will contribute from its private funds an annual sum, for a period to be fixed, towards meeting the deficiency between expenditure and income which may be expected to arise in the earlier years of the existence of the school."

The scheme met with a cordial reception in principle, but it was felt by a majority of the elected members that in view of the unfortunate financial stringency at the moment, it was not advisable to incur what must necessarily be a considerable capital expenditure.

The Great War intervened and the proposal was shelved until 1921, when enquiries were made regarding a portion of Westacre Creek (one of the farms on the Matopo Estate) being handed over by the Rhodes Trustees to the Government for a proposed school. The school was allotted, free of rent, 3,300 acres of Westacre Creek, which farm had been chosen partly on account of the fact that there were buildings which could be adapted to the requirements of the school and because it comprises typical red schist and granite soil, good veld, including both late and early grazing and good, dry, arable land, as well as 160 acres of irrigable soil. The school was allowed 160 five-hundredths of the water in the dam, and the experimental farm started by Rhodes was also handed over with the school to the Education Department.

From Dr. Nobbs' article in 1913 it is evident that he had then in view the establishment of an agricultural college, but in 1922 this idea had apparently been given up as being too ambitious, and the school as opened in 1923 was definitely not a college of agriculture, but a "secondary school where a general education is given, but with a bias to agricultural subjects."

The original title was "Primary School of Agriculture," but at the wish of the headmaster this was amended to "Matopos School."

Until 1926 both the farm and the school were controlled by the principal, under the Education Department. At this date it was felt that the farm was not being developed as rapidly as might be along the lines planned by Mr. Rhodes, and from 1st June, 1926, it was decided that the farm should be run as an experimental demonstration farm, under the control of the Department of Agriculture and entirely divorced from the school, which remained under the Education Department.

One of the first questions to which Mr. R. A. Fletcher turned his attention after his appointment as Minister of

Agriculture and Lands was the establishment of an agricultural college, and as a preliminary he invited Mr. W. J. Palmer, B.Sc.Agric., to report on the Matopo Government Farm and its relation to the question of agricultural education. Possessing a wide knowledge of the subject, Mr. Palmer drew up a most useful report. With the kind permission of the Union Minister of Agriculture, that very able authority on agricultural education, Colonel H. S. du Toit, M.Sc. (Agric.), D.T.D., visited Southern Rhodesia and drew up for the Government a report containing sound practical advice, based on the experience gained in the Union in regard to this subject, and on the conditions prevailing in Southern Rhodesia. In the opinion of both Mr. Palmer and Colonel du Toit, the time has undoubtedly arrived for the establishment of an agricultural college, and there is no more suitable place in the Colony for such a college than the Matopo Estate.

The arrangement of the final details for the school was left until the appointment of Professor C. K. Brain, M.A., D.Sc., as Acting Secretary of the Department of Agriculture and Lands, had been made. Dr. Brain acted as first principal of the Stellenbosch-Elsenberg College of Agriculture, the largest college of its kind in the southern hemisphere, and has been closely associated with the development of education and agriculture in South Africa for the last twenty-five years. The scheme for the establishment of the Matopo School of Agriculture was approved by the Government during October, 1929, when it was decided to start operations from the beginning of 1930.

**Farm Buildings, Live Stock, etc.**—The school is situated on the Matopo Estate, on the main road from Bulawayo to World's View, about 24 miles from the former place.

The farm comprises about 7,500 acres of the original Westacre Creek Farm, and is thoroughly representative of a large area of the country, including as it does a fair proportion of red and vlei grounds and granite sandy soils. About 400 acres are below the main irrigation furrow from the Matopo Dam, and there are thus ample facilities for producing all the more important summer and winter crops of the country.

The buildings comprise the school hostel, with accommodation for sixty scholars, the dining-room block, classrooms and laboratories, cow byres, piggeries, dairy building, poultry houses, office building and seven staff houses. The hostel is ideally situated and has spacious open air dormitories supplied with all hygienic conveniences.

On the sand veld section of the farm, about a mile and a half from the hostel, are the tobacco barns and grading shed, and students are given a thorough training in the growing and handling of tobacco, in addition to other crops.

An attempt has been made to secure a suitable foundation for building up representative herds of the more important breeds of cattle. The school possesses a dairy herd of Frieslands, and recent importations from England include ten heifers and two bulls of the following breeds for the school herds: Red Polls, Ayrshires and Jerseys. It is hoped to add a pedigree herd of Afrikanders in the near future.

Pigs are represented by Large Blacks and Large Whites, and there is a foundation flock of about eighty Merino sheep.

There is a commercial section of poultry and a few investigation pens, including all the popular breeds of heavy and light poultry, Rhode Island Reds, Orpingtons, Wyandottes, Sussex, Leghorns (Black and White), Ancona and Minorca. A limited number of water fowl will also be kept.

**Recreation.**—Scouting facilities are provided and a thorough training is given in cadet corps work, with special emphasis on musketry. Games, including rugby football, cricket, tennis, swimming, are carefully organised under the charge of competent members of the staff.

Facilities are provided for conveying scholars to and from Bulawayo when occasion arises. This was made possible through the generosity of Miss Reckitt, who kindly presented the school with a new Ford lorry specifically for the use of the students. When used for pleasure, a charge of one shilling per head return is made to defray expenses of petrol and oil, otherwise the lorry is maintained at Government expense.

The Matopo Farm.

The Rest Hut, Matopos, a favourite spot of Mr. Rhodes. It is now used for divine service by scholars at the Matopo School. The body of Mr. Rhodes rested here the night before burial at World's View.

## FUNCTIONS OF THE SCHOOL.

1. To continue the junior school course on lines similar to the present curriculum, leading to the Departmental Junior Leaving Certificate, but stressing the agricultural and rural side of instruction.

2. To supply a two years' course in agriculture, leading to a diploma in agriculture.

3. To supply short and special courses in different subjects for farmers, teachers, etc.

4. To carry out demonstration, experimental and investigational work in agriculture.

**(a) Junior School.**—The courses for the junior school will be arranged by the Director of Education and the Acting Secretary of Agriculture, and examinations conducted by the Department of Education.

The course offered by the junior school includes a general education in English subjects, geography, history and civics, book-keeping and business methods, mathematics, physical and agricultural science, up to the standard of the Departmental Junior Leaving Certificate.

The pupils also receive practical training in wood and metal work; the idea is not to turn out skilled artisans, but to teach the boys how to do such necessary repairs, etc., of this nature as may be required on a farm.

The agricultural work includes experimental plots, gardening, care of dairy stock and butter-making, poultry and bee keeping. The scholars will receive instruction and take active part in the demonstration and experimental work carried out under the direction of Mr. C. Mainwaring, the farm manager and director of practical work. This work will include variety trials in different cereals, potatoes, maize and tobacco, and the pupils will assist in the planting, cultivating, reaping and curing of these crops.

Every boy is allotted his own plot for vegetable growing; the proceeds of the sale of these vegetables are devoted to the school sports fund, so that the boys derive direct benefit from their work.

The dairy work includes training in milking, separating, butter-making and cheese-making.

It is a definite feature of the policy of the school that as much as possible of the actual manual work should be performed by the boys themselves; this will ensure their being able to supervise labour efficiently in later years.

The poultry includes several representative breeds, and the course comprises care and feeding of the stock, selection of breeding birds, trap nesting, incubation and rearing of chicks. Most of the appliances will be made by the scholars themselves.

N.B.—Although it is not possible to indicate the exact details of the diploma course until the principal is appointed, the following indicate the most essential points which will be dealt with.

**(b) Diploma Course.**—The two year diploma course will consist of approximately 60 per cent. practical training and 40 per cent. lectures or demonstrations on the science and theory of agriculture.

(a) *Practical Side.*—Students must actually perform the work themselves and acquire the necessary experience and efficiency in handling tools, animals, etc., for all major operations, including setting out, clearing, ploughing and preparing new land for crops, the production and management of all ordinary summer and winter crops for the area, the handling of all types of farm live stock and live stock products, including poultry, dairy work, wool, etc., the setting out and building of ordinary farm buildings, fences, etc., farm management, farm development, maintenance and improvements, tree planting, irrigating, draining, etc., the preparation and application of farm manure and fertilisers, checking of native labour, wages, etc., and a simple system of farm book-keeping, carrying out of ordinary farm repairs to implements, and the care of animal transport, etc.

(b) *Lectures and Demonstrations.*—The course includes elementary lectures and demonstrations in—

(a) agricultural chemistry;

(b) agricultural economics (including farm management and farm book-keeping);

(c) agricultural engineering;

(d) animal husbandry;

(e) field husbandry (including agricultural botany, forestry and special crops);

(f) veterinary science;

(g) diseases and pests of farm animals and farm crops.

Short courses for teachers and farmers are contemplated, but cannot be arranged until the necessary staff appointments have been made. When arranged, full particulars of such short or special courses will be advertised in the daily Press.

## ADMISSION AND FEES.

(a) *To Junior School.*—Scholars will be admitted to the junior school who—

(1) have passed Standard V.;

(2) have attained the age of fourteen;

(3) intend taking up work on the land after leaving school.

The fees are £48 per annum, which includes tuition, and boarding grants varying in amount may be allowed in reduction of fees in cases in which parents are unable to pay the full amount. Free boarders are not admitted.

(b) *To Diploma Course.*—Students are admitted to the diploma course who have passed the Junior Certificate Examination or its equivalent and who supply a medical certificate that they are able to carry out a full year's practical work in agriculture.

The fees for the diploma course are £60 per annum, which includes board and tuition.

N.B.—All fees are payable quarterly in advance to the Principal, Matopo School.

Concession tickets will be granted on the railways if a form signed by the principal or head master is presented when the ticket is applied for.

## THE SCHOOL YEAR, 1930.

17th January.—Applications for entrance should be sent in before this date.

27th January.—School opens.

11th to 27th April.—Easter vacation.

28th April.—School re-opens.

24th May.—Empire Day.

3rd June.—King's Birthday.

9th June.—Whit Monday.

28th June.—Winter holidays begin.

28th July.—Winter holidays end. School re-opens.

12th September.—Occupation Day of Mashonaland.

27th September.—Short vacation begins.

6th October.—Short vacation ends.

11th November.—Armistice Day.

20th December.—Summer holidays begin.

Students are expected to return to the school on the Saturday or Sunday preceding the opening of school, catching the 2.30 p.m. train from Bulawayo on Saturday or the 8.45 a.m. train on Sunday to Matopo Station.

## EMPLOYMENT WANTED.

Sixteen years as manager of ranch in Eastern Transvaal. Thoroughly efficient with cattle and all kinds of live stock, including sheep. Good knowledge of general agriculture. Fluent native linguist. Age 37 years; married, with one child. Willing to go anywhere in Northern or Southern Rhodesia. Testimonials available highly satisfactory. Apply H. B. Trollip, P.O. Hectorspruit, Barberton District.

# The Value of Rock Phosphate and "Bone and Superphosphate"

## AS FERTILISERS FOR MAIZE PRODUCTION.

By A. D. HUSBAND,
Chief Chemist, Department of Agriculture.

*The following article gives the results of a three years' experiment carried out at the Agricultural Experiment Station, Salisbury, to determine the comparative values of raw rock phosphate and bone and superphosphate as fertiliser for maize. Valuable data have been obtained and we direct the attention of maize growers to the conclusions arrived at by the Chief Chemist. The experiments are being continued with the object primarily of ascertaining the length of time the fertilisers will maintain the fertility of the soil.*—Ed., *R.A.J.*

The results obtained from numerous fertiliser experiments carried out by the Agricultural branch of the Department have demonstrated the value of phosphatic fertilisation of our soils for maize production. The phosphatic fertiliser applied in nearly all these experiments has been a mixture of bone and superphosphate, mainly for the reason that this mixture has a good mechanical condition and contains a fairly high percentage of its phosphorus in a citric soluble state.

Although there are many other phosphatic fertilisers on the market, the majority of these are, for one reason or another, not nearly so popular with Rhodesian farmers as the bone and superphosphate mixture. In the case of con-

centrated fertilisers; the mechanical condition is often unsatisfactory, and with low grade fertilisers the high cost of transport makes their use uneconomic. There is, however, one fairly concentrated phosphatic fertiliser having a good mechanical condition, and which is to-day obtainable in the Colony at a price considerably below that of all other phosphatic fertilisers. This fertiliser is ground rock phosphate, generally sold under the name of "raw rock phosphate." It is generally believed that this fertiliser is very slow in its action except on very acid soils, and that its use does not lead to the same beneficial results as are obtained by the use of bone and superphosphate. There are, however, a number of farmers in the Colony who claim to have obtained equally good results by the use of raw rock phosphate as with superphosphate or "bone and superphosphate," and as the former is easier to handle, cheaper and less destructive on sacks than fertilisers containing a large proportion of superphosphate, the use of raw rock phosphate has greatly increased during the past two or three years.

In view of the interest shown by farmers in rock phosphate, it was decided to carry out a number of field trials to compare the relative value of this material with the standard "bone and superphosphate" as fertilisers for maize. With this object in view a number of plots were laid down at the Salisbury Experiment Station in December, 1926, by Mr. Blackshaw and Mr. Facer, formerly of this Division.

The soil on this station consists of a red dolerite loam, and is neutral in re-action (pH=7.1).

**Plan of Experiment.**—In the endeavour to overcome the difficulty of variations in inherent fertility found on soils at this station it was decided to carry out the experiment on plots that had already been planted to maize for three successive years, during which time careful records had been made of the yields obtained from each individual plot. By this method it was possible to arrange the plots in groups in such a way that each group would have approximately equal maize producing powers. Twelve plots of 1-10th acre each were chosen, and divided into three groups of four plots, each group being so arranged that the total yield of maize over the three years was approximately the same in each group. One group was kept as a control, to a second was

added "bone and superphosphate," and to the third raw rock phosphate. All the plots were planted at the same time in December, 1926, and the fertiliser was applied to the fertilised plots in the row immediately prior to planting at the rate of 150 lbs. per acre in each case. The particulars of the fertiliser applied are as follows:—

| | Phosphoric oxide. | | Nitrogen. |
|---|---|---|---|
| | Soluble in citrate solution. | Total. | |
| | Per cent. | Per cent. | Per cent. |
| Bone and superphosphate (one-third bone) ... | 12.6 | 19.0 | 1.3 |
| Rock phosphate ... ... | 12.7 | 38.8 | ... |

The cost per acre of the application of the fertiliser given, calculated on the prices ruling in December, 1926, was:—

12s. 6d. per acre for the bone and superphosphate, and

11s. 5d. per acre for the raw rock phosphate.

The plots have now been cropped for three years with maize and no further application of fertiliser has been given.

It must be noted that the total amount of phosphoric oxide in the raw phosphate rock application is considerably in excess of that in the bone and superphosphate application, although the citrate soluble phosphate is practically the same in each case. This experiment, therefore, is no criterion of the relative values of the unit of phosphoric oxide in "bone and superphosphate" and raw rock phosphate, but merely shows their relative value, weight for weight, as a fertiliser for maize. This, however, from an economic standpoint is a matter of material importance to farmers owing to the difference in price between these two fertilisers, a difference which is considerably greater to-day than when this experiment was commenced. The cost of these fertiliser applications at the present ruling prices would be approximately 12s. 4d. for the "bone and superphosphate" and 8s. 5d. for the rock phosphate, which means a difference of £20 on each 100 acres fertilised.

The data obtained are shown in the following table:—

*Control Plots.*

| No. of plot. | Total yields for years 1924, 1925 and 1926. | Average yield for first 3 years. | Yields of maize during 1927. | 1928. | 1929. | Total yield for second 3 years. | Average yield during second 3 years. |
|---|---|---|---|---|---|---|---|
| | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. |
| 64 | 724 | 241 | 313 | 70 | 216 | 599 | 200 |
| 68 | 553 | 184 | 209 | 33 | 154 | 396 | 132 |
| 70 | 629 | 210 | 215 | 69 | 191 | 475 | 158 |
| 73 | 648 | 216 | 216 | 58 | 171 | 445 | 148 |
| *Bone and Super.' Plots.* | | | | | | | |
| 62 | 704 | 235 | 343 | 100 | 240 | 683 | 228 |
| 65 | 581 | 194 | 315 | 104 | 185 | 604 | 201 |
| 69 | 621 | 207 | 341 | 112 | 244 | 697 | 232 |
| 78 | 658 | 219 | 368 | 153 | 213 | 734 | 245 |
| *Rock Phosphate Plots.* | | | | | | | |
| 61 | 609 | 203 | 307 | 150 | 270 | 727 | 242 |
| 63 | 626 | 209 | 319 | 82 | 278 | 679 | 226 |
| 75 | 616 | 205 | 335 | 200 | 271 | 806 | 269 |
| 77 | 702 | 234 | 349 | 132 | 224 | 705 | 235 |

Analysing the above table we obtain the following:—

*Control Plots.*

Pre-period of 3 years—

Total yield from four 1-10th acre plots ... = 2,554 lbs.

Calculated as yield per acre ... ... ... ... = 6,385 lbs.

Average annual yield per acre = 10 *bags* 128 *lbs.*

Experimental period of 3 years—

Total yield from four 1-10th acre plots = 1,915 lbs.

Calculated as yield per acre ... ... ... = 4,787.5 lbs.

Average annual yield per acre = 7 *bags* 196 *lbs.*

*Bone and Super. Plots.*

Pre-period of 3 years—

Total yield from four 1-10th acre plots ... = 2,564 lbs.
Calculated as yield per acre ... ... ... ... = 6,410 lbs.

Average annual yield per acre = 10 *bags* 137 *lbs.*

Experimental period of 3 years—

Total yield from four 1-10th acre plots ... = 2,718 lbs.
Calculated as yield per acre ... ... ... ... = 6,795 lbs.

Average annual yield per acre = 11 *bags* 65 *lbs.*

*Rock Phosphate Plots.*

Pre-period of 3 years—

Total yield from four 1-10th acre plots ... = 2,553 lbs.
Calculated as yield per acre ... ... ... ... = 6,382 lbs.

Average annual yield per acre = 10 *bags* 127.5 *lbs.*

Experimental period of 3 years—

Total yield from four 1-10th acre plots = 2,917 lbs.
Calculated as yield per acre ... ... ... . . = 7,292.5 lbs.

Average annual yield per acre = 12 *bags* 31 *lbs.*

The average annual increase of the fertilised plots over the controls for the experimental three years will be seen to be 3 *bags* 69 *lbs.* in the case of the *bone and super. plots,* and 4 *bags* 35 *lbs.* in the case of the *raw phosphate rock.*

**Discussion of Results.**—The most striking result in this experiment is the remarkable efficacy of the application of both the phosphatic fertilisers used in maintaining over the period of three years the fertility of the soil.

It will be seen that in each case the productive capacity of the plots in the control group has decreased considerably, whereas in only one instance is there any decrease in any of the eight fertilised plots, and the decrease in this one instance is insignificant. Not only has the fertiliser maintained the fertility of the plots, but in nearly every instance has actually increased it. The increase is more marked in the case of the rock phosphate, although quite definite in the case of the "bone and superphosphate."

The importance of fertilisation from the economic aspect is so greatly emphasised in this experiment as to be worthy of special mention. It will be seen that the actual return

in bags of maize over the three years for the expenditure of 12s. 6d. in "bone and superphosphate" is 10 bags 7 lbs., and for 11s. 5d. on rock phosphate 12 bags 105 lbs., the outlay on rock phosphate producing a return of approximately 25 per cent. in excess of that obtained from "bone and superphosphate."

It is also interesting to note the big variations in the yields obtained during the three experimental years due to varying climatic conditions. The season 1927-28 was a particularly bad one from the point of view of rainfall, and it will be seen that during this season the unfertilised plots were apparently affected to a much greater degree than the fertilised plots.

It should also be noted that the response to the fertiliser treatment is greater during the first season on the "bone and superphosphate" plots than on the rock phosphate plots, but during the second and third years of the experiment the position was reversed. The results indicate, therefore, that the availability of the phosphate in "bone and superphosphate" is greater than in rock phosphate, and show the desirability of judging the value of fertiliser treatment over a series of years rather than on one season.

It must not be assumed that on all the types of soil in the Colony and in areas having a considerably lower rainfall than the Salisbury district similar results to the above will be obtained. The results recorded here, however, are sufficient to show the importance to the farmer of the saving that might be effected by a knowledge of the value of different fertilisers, and indicate the financial gain that might accrue from an experiment of this nature carried out on his own farm.

Summarising the results obtained in this experiment one might say that, weight for weight, raw rock phosphate is equally as efficacious, if not slightly more so, than "bone and superphosphate" in maintaining the fertility of red doleritic soil under climatic conditions such as exist in the Salisbury district.

Acknowledgment is made to Mr. H. C. Arnold, Manager of the Salisbury Experiment Station, for the thorough and efficient manner in which he carried out all the field work in connection with this experiment.

# Notes from the Veterinary Laboratory.

By Ll. E. W. Bevan, M.R.C.V.S.,
Director of Veterinary Research.

*"Ill fares the land, to hastening ills a prey,*
*Where wealth accumulates and men decay:*
*Princes and lords may flourish or may fade;*
*A breath can make them, as a breath has made;*
*But a bold peasantry, their country's pride,*
*When once destroyed, can never be supplied."*
Goldsmith, "The Deserted Village."

The above quotation appears to be particularly applicable to Southern Rhodesia at the present time. While wealth accumulates in the towns, our "bold peasantry" is hard put to it "to make ends meet." Experts are quick to explain the situation and point to the "single crop" as the root of all evil, wisely proclaiming "mixed farming" as the panacea. This no doubt is correct in theory, but in practice it is frequently found more or less easy to grow a multiplicity of minor crops, but difficult to find a market for them. Often it happens that the only way of disposing of them is to "put them on four legs." It is for that reason that live stock plays such an important part in the economics of the farm. But if live stock is to prove profitable, some knowledge of animals, how to breed, feed and tend them, how to protect them from disease and treat them when sick, how to make the most of them and sell them and their products to the best advantage, is necessary. There are some who, as if by some divine instinct, know or pretend to know all about these things, but there are many who do not. It is with a view to establishing an entente between the laboratory and the latter that these "Veterinary Notes" are written.

It is confidently believed that such collaboration will prove mutually beneficial; the laboratory worker can sometimes help the practical man, and *vice versa.*

As the result of the re-appearance of the "Notes," several very interesting communications have been received. These relate to various subjects, some of which will be referred to in the present issue; others will be dealt with later.

**Undulant Fever.**—A correspondent whose cattle have for some time past been suffering from contagious abortion writes that his assistant has contracted undulant or Malta fever. There are no goats, which are the usual source of infection with this disease, on the property, and it is probable that the infection has been contracted from the cattle suffering from abortion disease.

In 1918, Alice Evans, an American scientist, demonstrated a close relationship between the organism responsible for infectious abortion of domesticated animals and the so-called *Micrococcus melitensis*, the cause of undulant or Malta fever in man, which by laboratory tests could not be differentiated. In 1920, also, the writer drew attention to the fact that in Rhodesia certain cases presenting symptoms resembling undulant fever had occurred in human subjects, who, as far as was known, could not have obtained infection from goats, but had resided on farms where cattle were or had been infected with contagious abortion. He found that the serum of such patients would agglutinate *Br. abortus* and, *vice versa*, the serum of cattle would agglutinate *Br. melitensis.* The announcement of this discovery gave rise to considerable criticism. It was pointed out that in Great Britain, where outbreaks of contagious abortion were numerous and milk from infected animals was extensively used, Malta fever was practically unknown. The probable reason why Malta fever was "practically unknown" was because it was not commonly recognised. In the light of present knowledge it is better understood, and many cases which at one time would have been regarded as rheumatism, malaria, typhoid, paratyphoid or influenza are now known to be due to infection by the *Br. abortus.* According to members of the medical profession, undulant fever in man in Southern Rhodesia does not differ from Malta fever else-

where, except that the temperature does not always conform with text-book descriptions. The chief symptoms appear to be pyrexia, headaches, anæmia, swollen spleen and liver, and pains in the joints. It is possible that abortion might be found to be another symptom, if appropriate tests were carried out. It is a remarkable fact that patients improve when they leave Rhodesia and live for a time at sea level. This has become the favourite form of treatment and is undoubtedly the most successful.

It is generally believed that the disease is contracted from infected milk or dairy products, but if so, it is difficult to understand why on some farms the man has become infected and not the women and children. If, on the other hand, infection is contracted by contact with cattle or through the dust of the cattle sheds or kraals, it is strange that in some instances the women have become infected and not the men. To explain these strange circumstances it has been suggested that as the result of frequent exposure to mild infection, immunity is set up and that it is those who do not possess this immunity or whose resistance is broken down by some other cause who contract the disease. The victims, however, are not always the weakest; in some instances they have been the most robust members of the family. The disease is not so prevalent throughout the Colony that the population generally can have become immune. If it were so, visitors would run a grave risk. As far as is known, none of them has become infected. On the other hand, more than one case is known where the first victim on a farm was a recently arrived pupil. My correspondent brings such a case to my notice, and writes: "I explained to the doctor that we knew which our infected animals were and that we only took milk from the non-infected, and that to make doubly sure all this milk was boiled. I told him I have four children here, and that if H—— had got the disease through the milk or butter, then the children, my wife and I would have got the disease too. His reply was that he had come to the conclusion that the disease was generally contracted through inoculation with the germ and not through milk, otherwise every other person in the country would be suffering from the disease."

He then proceeds to explain that H—— had probably contracted the disease by inoculation. He says he remembers

that "when a big grade (red) cow produced a premature calf—full size, but very weak—on 2nd June, H—— rubbed the calf down and nursed it till it died twelve hours later, and remarked that the 'slime' on the calf 'made the cuts on his hands sting.' This turned out to be my second case of contagious abortion, as you will remember my coming in to see you with a blood test and it proving positive. So I am now inclined to think that this was the occasion when H—— first picked up the germ. As far back as 15th July he began to be unfit, but nothing to speak of, and then he gradually got more and more unfit and tired as time went on. Then he started having pains in his back, intermittent headaches, and then violent sweating fits during his sleep. We then found he had a temperature and called in Dr. M——, who suspected enteric, and I then took the lad straight into hospital, where three days later they diagnosed the fever. His temperature was normal again for the first time on or about 8th October. Every new cow I buy in future will be isolated until I have taken a blood test."

The details of this case are reproduced at length because they not only give a very clear description of the course of the disease, but emphasise the danger of infection to man from contact with infected material from an aborting cow. Recent literature records cases from several countries where infection was probably contracted in this way. For example, Van der Holden, in Holland, records seven cases of *abortus* infection through drinking milk and five from assisting in parturition cases. Meyer, of Germany, describes his own infection with *Br. abortus*, which he contracted as the result of cleansing a cow which was infected. The first thing noticed was pain in the neighbourhood of the nail of the middle finger of the left hand on the evening of the day after which the after-birth had been removed.

Again, at the recent annual meeting of the American Veterinary Medical Association a special committee on contagious abortion reported: "The relation of this infection of cattle and other domestic animals to human health has been studied during the past few years, and the results indicate that there is a definite relation between this disease and human health. The fear of contracting undulant fever from milk will affect the dairy industry, whether or not

milk is more than a remote danger. Producers of certified milk are already ridding their herds of Bang's disease. Veterinarians must keep in close touch with the latest developments in connection with the relation of this infection to human welfare if they desire to render full service to their clients. A study of reported cases of infection with *Bacterium abortus* indicates that many come from sources other than milk. Direct contact with infected animals, both cattle and hogs, and handling infected pork products, seem to constitute active sources of infection for man. Milk from abortion-infected animals can be rendered safe by efficient pasteurisation."

The object of this note is to put stockmen on their guard against the risk of infection when attending to the delivery of an infected cow or removing the fœtal membranes, which are generally highly charged with the germ of the disease. The so-called "slime" referred to in the letter is the amniotic fluid, which is also infective.

Although little importance is attached by stockmen to contagious abortion of cattle at the present time, the danger to human health may give them cause to think. The following list of cases tested by the Public Health Laboratory, Salisbury, by no means indicates all the cases occurring during the period. Some were not diagnosed, and many victims probably left the Colony believing themselves to be suffering from malaria and other diseases.

Cases of Undulant Fever Diagnosed by the Agglutination Test at the Public Health Laboratory, Salisbury.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1920 | ... | 1 case | ... | Tested by Bevan. | | |
| 1921 | ... | 14 cases | ... | ,, | P. H. D. | |
| 1922 | ... | 22 ,, | ... | ,, | ,, | |
| 1923 | ... | 19 ,, | ... | ,, | ,, | |
| 1924 | ... | 26 ,, | ... | ,, | ,, | |
| 1925 | ... | 38 ,, | ... | ,, | ,, | |
| 1926 | ... | 22 ,, | ... | ,, | ,, | |
| 1927 | ... | 15 ,, | ... | ,, | ,, | |
| 1928 | ... | 19 ,, | ... | ,, | ,, | |

In a table of cases kindly supplied by the Medical Department to the writer in 1925, details of thirty-five cases which had occurred during the previous four years were

given. On analysis fifteen were known by the writer to have come from areas where infectious abortion of cattle existed or the patients must have consumed dairy products from infected herds. Twenty-six out of the thirty-five were men, five were women and four were children. Among the men were a postmaster, a teacher, a doctor, a mine manager, an engineer, a storekeeper, three Civil Servants, one engaged in the timber trade, two butchers and twelve farmers.

Although contagious abortion of cattle has been removed from the list of scheduled animal diseases, undulant or Malta fever has been included under the Public Health Act of 1914, which provides for the inspection of dairy cattle and of animals intended for human consumption, and of dairies, cow sheds, milk shops, etc., and for the taking and examination of samples of milk and dairy products. Under this Act the Minister may make orders "requiring the closing of any cow shed, dairy or milk shop, or the exclusion from any cow shed or dairy premises of any animal, the milk from which there is reason to believe has conveyed or is liable to convey any infectious or other disease prejudicial to public health."

**East Coast Fever.**—In August last a number of very distinguished veterinarians from all parts of Africa met together at Pretoria to discuss the various problems presented by the numerous diseases affecting stock in that continent. Their time was fully occupied, for the old saying "ex Africa semper aliquid novi" particularly applies to animal diseases. Among other subjects discussed at great length and in considerable detail was East Coast Fever, a disease which is of special interest to us in Southern Rhodesia.

The conference recognised the fact that East Coast Fever was enzootic in Eastern and Central Africa and that consequently the problem was an entirely different one to that in Southern Rhodesia, where there was, in the opinion of the conference, *no evidence of it becoming enzootic.* It was recognised that in Eastern Africa control measures only were feasible, while in South Africa total eradication had to be aimed at. In regard to areas where disease was enzootic, the conference considered that this control should consist particularly of applying measures to reduce the mortality to a minimum, and for this purpose recommended short-interval dipping, hand dressing and fencing.

After careful review of the East Coast Fever position in South Africa the conference arrived at the opinion that as the incidence of the disease had been reduced to such relatively narrow limits, most energetic measures by all South African territories should be adopted in order to arrive at final eradication, and recommended the following:—

(a) Close supervision of all suspected areas with the object of obtaining an early and certain diagnosis. For this purpose a careful check of all cattle was considered essential.

(b) Close quarantine of all infected and suspected areas and strict control over the movements of all cattle in such areas.

(c) (1) Slaughter or removal of all cattle from the infected farm or area; such a farm or area to be kept free of all cattle for a period of at least 15 months. To this the following rider was added: "*It is realised that this method, although recognised as the most effective for early eradication, may not always be practicable or advisable.*"

(2) Short interval dipping (not exceeding five days) at the approved strength, and hand dressing.

(d) Fencing of all infected areas and such other adjoining areas as local circumstances may require.

(e) Branding of all cattle on infected and suspected areas.

(f) An adequate and efficient staff was considered essential for carrying out any or all of these measures.

(g) The conference considered that all cattle infected or suspected to be infected with East Coast Fever should be destroyed immediately (*vide* section C, para. 1).

It is satisfactory to note that the measures suggested are those which for some time past have been practised in Southern Rhodesia.

The principle of slaughter is probably based upon the assumption that an animal which has been infected and has recovered may at a later date become a source of infection. The mysterious re-appearance of the disease after an interval

of years on previously infected areas lends support to this contention, but no definite evidence has ever been brought forward to prove it. On the contrary, all experiments designed to break down the hypothetical "tolerance" of the recovered animal have failed. Recent experiments in Kenya Colony have shown that the immunity of a recovered animal is of brief duration, which suggests that the persistence of infection is also limited. If it were not so, recurrences or relapses would occur and the death of "salted" animals would be so common as to attract attention. Any measure, however, which aims at breaking that very delicate association between parasite, transmitter and host which must exist for the perpetuation of this disease is theoretically sound. In the study of tropical diseases, depending upon protozoa or other animal germs, it is common to find the conditions governing their transmission from host to host through invertebrate and other intermediaries so precise and exact that it is remarkable that it is ever achieved. For example, human malaria depends upon a special species of mosquito obtaining a special species of protozoal parasite from the blood of a human being suffering from the disease in a special form, and under such conditions that the parasite can undergo a very specialised development in the mosquito, in which it remains until special conditions render its return to man possible. By studying the habits of the special mosquito and using the knowledge so acquired to destroy it the cycle was broken and the Panama zone cleared of malaria. In the case of East Coast Fever it is sought to break the cycle by destroying the vertebrate host by means of the rifle and the tick by means of short-interval dipping.

When one considers the very exact conditions which are necessary for the successful development and survival of the East Coast Fever parasite one is astonished that the disease has survived so long. In the first place it is only during the last few days before the death of an infected animal that the parasite makes its way into the blood stream in such a form that it can be taken up by the tick in the act of feeding. And for its further sexual development a special species of tick, the *Rhipicephalus*, is necessary; a blue tick or a striped-legged tick will not suffice. Moreover, the brown tick (*Rhipicephalus appendiculatus*) does not, like

the blue tick, remain on the animal for weeks, but its presence on the ox is limited to periods of a few days—sometimes only three days at a time. For the successful perpetuation of East Coast Fever this brief period must synchronise with the equally brief period of invasion of the peripheral blood of the ox by the causal parasite. The odds against it are enormous. Then again the infected tick, having survived many vicissitudes, must at the long last find a suitable bovine host into which to inoculate the parasite it carries. If perchance it feeds upon an animal of another species, say, a horse or a sheep, the parasite cannot establish itself in them, and possibly the tick, by reason of the unfavourable blood it imbibes, becomes unsuitable for the further development of the parasite. These and many other circumstances render the transmission of the disease a very precarious process. That in spite of the efforts of the Veterinary Department it should have been successfully accomplished for so many years is as remarkable as the apparent predilection of the tick for the open gate.

**Phosphorus.**—One of the most interesting discussions at the recent Pan-African Agricultural and Veterinary Conferences was in connection with the various deficiencies of pastures, during which Professor P. J. du Toit presented a paper on "The Value of Phosphorus in the Cattle Industry in South Africa." This was reproduced in *The Farmers' Weekly*, 14th August, 1929, and is worthy of the closest consideration by stockmen. A few facts and figures gleaned from it may serve to demonstrate its practical importance.

Dr. du Toit pointed out that large areas of potentially excellent cattle pastures are markedly deficient in phosphorus; "indeed, it would seem as if no other country is so deficient in phosphorus as parts of South Africa." He described how, in the course of experiments in lamsiekte, Theiler and his co-workers showed that not only could this disease be prevented by supplying phosphorus in the form of bone meal, but that by so doing most remarkable results were obtained in other directions, the rate of growth of treated animals being accelerated, the milk yield of cows being increased, the average mortality being reduced, the "calf crop" being increased, the calves thriving and keeping in good condition. It was shown that the calves of bone-meal-fed mothers

weighed at the time of birth approximately the same as those from cows not so treated, but at weaning the former had increased in weight to the extent of 16 per cent. in their favour. Thus—

*Influence of Phosphorus on the Weight of Calves.*

| | At Birth. | At Weaning. |
|---|---|---|
| | Average weight. | Average weight. |
| Control calves ... | 68.1 lbs. | 351.5 lbs. |
| Calves of bone-meal-fed cows ... | 68.8 lbs. | 409.0 lbs. |

It was also demonstrated that the fertility of cows receiving bone meal was markedly higher than control cows receiving no bone meal.

*Influence of Phosphorus on Fecundity.*

| Cows not receiving Bone Meal. | | Cows receiving Bone Meal. |
|---|---|---|
| | CALVES | BORN. |
| 1926 ... ... | 59.7 per cent. | 82.6 per cent. |
| 1927 ... ... | 55.8 per cent. | 92.9 per cent. |
| 1928 ... ... | 51.6 per cent. | 86.1 per cent. |
| None calved three times in three years.<br>65 per cent. produced two calves in three years.<br>35 per cent. produced one calf. | | 66.1 per cent. gave three calves in three years. |

"It would appear that gestation and lactation impose a very severe strain on the mineral reserves of the cow, and that unless the reserve is replenished the animal will not become pregnant the next year."

*Influence of Phosphorus on the Milk Yield.*

| | Receiving Bone Meal. | Receiving no Bone Meal. |
|---|---|---|
| | FRIESLAND GRADE COWS. | |
| Dec. 1928 to Jan. 1929 | 2,114.6 lbs. of milk | 1,236.9 lbs. of milk |
| Apl. 1929 to June 1929 | 455.1 „ „ „ | 226.7 „ „ „ |
| | RED POLL COWS. | |
| Dec. 1928 to Jan. 1929 | 2,276.6 lbs. of milk | 1,358.9 lbs. of milk |
| Apl. 1929 to June 1929 | 547.6 „ „ „ | 234.2 „ „ „ |

The practical deduction drawn from the test is thus expressed: "If we reckon the value of milk at 1s. per gallon we see that the bone meal cow produced £4 10s. worth of milk more than the control cow during the period under discussion. If we now reckon the bone meal at £8 per ton we find that the value of the bone meal given to the cow during the period was 3s. 5d."

Experiments to determine the influence of bone meal on beef production were carried out. Twenty animals received bone meal with their feed and eight controls did not. Two of the latter died during the experiment. They were all dependent on the natural pasture for their sustenance, and received no other feed. When about three years old the experiment was concluded and all the animals were sent to the abattoirs.

The following details are of great practical interest:—

*Influence of Phosphorus on Meat and Hides.*

THREE-YEAR-OLD STEERS RECEIVING BONE MEAL.

| Number. | Breed. | Weight. Average. | Price realised. Average. | Dressed weight. Average. | Price of meat. Average. | Weight of hide. Average. | Price per hide. Average. |
|---|---|---|---|---|---|---|---|
| | | lbs. | £ s. d. | lbs. | p. lb. | lbs. | £ s. d. |
| 5 | Friesland Grades | 1,180 | 7 15 9 | 597 or 50% | 3·06d. | 71 | 1 6 7½ |
| 5 | Red Polls ... | 1,224 | 9 17 2 | | | | |
| 5 | Sussex ... ... | 1,222 | 10 11 0 | | | | |
| 5 | Africanders ... | 1,148 | 9 1 6 | | | | |
| | CONTROLS. RECEIVING NO BONE MEAL. | | | | | | |
| 6 | Survivors of Original 8 | 737 | 3 13 5 | 339 or 46% | 1.7d. | 48.3 | 0 18 0½ |

It is also claimed that bone-meal-fed cows showed a longer body, a wider chest, a greater heart girth, a greater width between the hook-bones than controls which received no bone meal. The bone-meal-fed calves also showed superior skeletal development. It is also said that the feeding of bone meal reduces the incidence of disease. During the period of the experiment 344 calves were born alive in the bone-meal-fed groups. Of these, 13 (3.8 per cent.) died during the period 1st January, 1926, to 30th June, 1928 (2½ years). Of the 81 control calves, 18 (22.2 per cent.) died during the same period.

Experiments were carried out with a view to finding a substitute for bone meal, and eventually commercial calcium phosphate was found to be not only more efficacious, but relatively cheaper, two-thirds of an ounce of calcium phosphate being as good as three ounces of bone meal.

Professor du Toit summarises his paper in the following practical manner, comparing the experiences of two farmers, the one feeding phosphorus compounds to his cattle, the other not doing so.

## TWO CATTLE FARMERS.

| "A" finds:— | "B" can show:— |
|---|---|
| That his cattle are in poor condition. | That his cattle are in excellent condition, even during the dry winter months. |
| That mortality among his animals is so high that he has to keep on buying new cattle to keep his herd up to strength. | That the mortality among his cattle is low—only about one-fifth to one-tenth of that on his neighbour's farm. |
| That his "calf crop" is very small, only about 50 per cent. of the cows producing calves. | That his "calf crop" is excellent, about 90 per cent. of his cows calving. |
| That his cows breed very irregularly, each cow producing a calf every second or third year only. | That a large percentage of his cows (about two-thirds) give birth to a calf regularly every year. |
| That his cows produce very little milk and very soon go dry. | That his cows are excellent milkers, yielding at least double the amount of milk obtained by his neighbour and securing for him a handsome return from the creamery. |
| That the calves are very slow to grow and remain stunted and in poor condition. | That his calves thrive, are quick growers and keep in good condition. |
| That there is a very heavy mortality among his calves. | That the mortality among his calves is only one-fifth to one-tenth as high as on his neighbour's farm. |
| That the young oxen which he wants to send to the butcher are slow in maturing and fetch very poor prices because of the poor quality of the beef. | That his young oxen reach a weight of 1,200 lbs. at the age of three years or less and fetch excellent prices at the butchers, the beef being classed as "prime." |

| | |
|---|---|
| That his young heifers are slow in reaching sexual maturity and are poor breeders, like their mothers. | That his heifers are sexually mature at two years and breed regularly. |
| That his herds are rapidly decreasing instead of increasing, and that his animals tend to revert to the "scrub" or "native" types, in spite of the improved blood of the bulls. | That his herds increase rapidly and that he always has surplus animals to dispose of. That the "grading up" process is entirely successful and that his stock remain "true to type." |
| That his farming is entirely unprofitable. | That his farming pays handsomely, the amount which he spends on bone meal (and which he hopes to reduce to one-third by substituting a more economical produce for bone meal) being insignificant in comparison with the profits which he makes on the sale of his slaughter cattle and his dairy products. |

One is tempted "to point a moral" by emphasising the practical value of these researches which may revolutionise the cattle industry of South Africa. It must be conceded that Theiler, du Toit and their co-workers have added yet another triumph to the credit of veterinary research.

**Sex.**—Much has been written concerning the principles which govern the determination of sex, but notwithstanding the experiments carried out by scientists and the theories of practical observers, Nature still strictly guards her secret. The following details collected from the stock book of Mr. Glanfield's famous Ballineety herd of Sussex cattle may prove of interest, but I leave it to my readers to draw their own conclusions—if any can be drawn.

## BALLINEETY CHARMING.

| Sire. | Dam. |
|---|---|
| Apsley Albert 3rd. (Imported.) | Bonnette's Bouquet. (Imported.) |

| | | | | |
|---|---|---|---|---|
| 12.9.18 | Bull calf | No. | 51 |
| 8.2.20 | ,, | ,, | ,, | 67 |
| 22.2.21 | ,, | ,, | ,, | 79 |
| 1.1.22 | ,, | ,, | ,, | 85 |
| 10.8.24 | ,, | ,, | ,, | 135 |
| 20.9.25 | ,, | ,, | ,, | 152 |
| 12.7.26 | ,, | ,, | ,, | 176 |
| 1.8.27 | ,, | ,, | ,, | 210 |
| 3.8.29 | ,, | ,, | ,, | 288 |

## BALLINEETY COMELY.

| Sire. | Dam. |
|---|---|
| Apsley Albert 3rd. (Imported.) | Tutsham Ballet. (Imported.) |

| | | | | |
|---|---|---|---|---|
| 21.12.23 | Bull calf | No. | — |
| 23.9.26 | ,, | ,, | ,, | 194 |
| 11.11.27 | ,, | ,, | ,, | 231 |
| 2.1.29 | ,, | ,, | ,, | 265 |

## BALLINEETY CANDY.

| Sire. | Dam. |
|---|---|
| Apsley Albert 3rd. (Imported.) | Somerhill Dewdrop. (Imported.) |

| | | | | |
|---|---|---|---|---|
| 10.12.19 | Heifer calf | No. | 66 |
| 24.3.21 | ,, | ,, | ,, | 82 |
| 25.5.22 | ,, | ,, | ,, | 92 |
| 16.11.23 | Bull calf | No. | 120 |
| 12.11.25 | Heifer calf | No. | 169 |

## BALLINEETY DUCHESS.

| Sire. | Dam. |
|---|---|
| St. Albans XIII. | Tutsham Ballet. |
| (Imported.) | (Imported.) |

| | |
|---|---|
| 23.10.20 ... ... ... ... ... ... | Bull calf No. 74 |
| 2.4.22 ... ... ... ... ... ... | ,, ,, ,, 90 |
| 16.3.23 ... ... ... ... ... ... | ,, ,, ,, 106 |
| 13.4.24 ... ... ... ... ... ... | ,, ,, ,, 131 |
| 17.9.25 ... ... ... ... ... ... | ,, ,, ,, 165 |
| 16.8.26 ... ... ... ... ... ... | ,, ,, ,, 184 |
| 1.8.27 ... ... ... ... ... ... | ,, ,, ,, 208 |
| 25.1.29 ... ... ... ... ... ... | ,, ,, ,, 268 |

## BALLINEETY DORA.

| Sire. | Dam. |
|---|---|
| St. Albans XIII. | Ballineety Bess. |
| (Imported.) | (Locally bred.) |

| | |
|---|---|
| 11.11.20 ... ... ... ... ... | Heifer calf No. 76 |
| 22.2.22 ... ... ... ... ... | ,, ,, ,, 88 |
| 22.2.23 ... ... ... ... ... | ,, ,, ,, 117 |
| 14.9.24 ... ... ... ... ... | ,, ,, ,, 138 |
| 20.8.25 ... ... ... ... ... | ,, ,, ,, 138 |

## BALLINEETY GIRTON.

| Sire. | Dam. |
|---|---|
| Otham Oddfellow. | Ballineety Dora. |
| (Imported.) | (Locally bred.) |

| | |
|---|---|
| 18.12.24 ... ... ... ... ... ... | Bull calf No. 145 |
| 27.1.25 ... ... ... ... ... ... | ,, ,, ,, 155 |
| 1.7.26 ... ... ... ... ... ... | ,, ,, ,, 175 |
| 23.7.27 ... ... ... ... ... ... | ,, ,, ,, 207 |
| 15.7.28 ... ... ... ... ... ... | ,, ,, ,, 246 |
| 5.7.29 ... ... ... ... ... ... | ,, ,, ,, 283 |

## BALLINEETY GLEE.

| Sire. | Dam. |
|---|---|
| Otham Oddfellow 12th. | Ballineety Fanny. |
| (Imported.) | (Locally bred.) |

| | |
|---|---|
| 20.9.26 ... ... ... ... ... | Heifer calf No. 192 |
| 7.10.27 ... ... ... ... ... | ,, ,, ,, 227 |
| 24.2.29 ... ... ... ... ... | ,, ,, ,, 269 |

## BALLINEETY GERTRUDE.

| Sire. | Dam. |
|---|---|
| Otham Oddfellow 12th. | Tutsham Ballet. |
| (Imported.) | (Imported.) |

| | |
|---|---|
| 3.11.24 ... ... ... ... | Heifer calf No. 145 |
| 24.6.26 ... ... ... ... | Bull calf No. 173 |
| 23.8.27 ... ... ... ... | Heifer calf No. 215 |
| 15.11.28 ... ... ... ... | Bull calf No. 260 |

## BALLINEETY FAIRY.

| Sire. | Dam. |
|---|---|
| Blue Coat Pat. | Tutsham Ballet. |
| (Imported.) | (Imported.) |

| | |
|---|---|
| 3.3.21 ... ... ... ... ... | Bull calf No. 81 |
| 14.1.22 ... ... ... ... | Heifer calf No. 87 |
| 10.5.23 ... ... ... ... | ,, ,, ,, 108 |
| 9.9.24 ... ... ... ... ... | Bull calf No. 137 |
| 9.10.25 ... ... ... ... | Heifer calf No. 166 |
| 1.11.26 ... ... ... ... | Bull calf No. 198 |
| 30.7.28 ... ... ... ... | Heifer calf No. 250 |

## TUTSHAM BALLET.
(Imported.)

| Sire. | Dam. |
|---|---|
| Tutsham Gold. | Stephanotes. |

| | |
|---|---|
| 28.12.13 ... ... ... ... | Bull calf No. 17 |
| 25.11.14 ... ... ... ... | ,, ,, ,, 24 |
| 24.12.15 ... ... ... ... | ,, ,, ,, 30 |
| 28.10.16 ... ... ... ... | Heifer calf No. 37 |
| 23.9.17 ... ... ... ... | ,, ,, ,, 46 |
| 4.10.18 ... ... ... ... | ,, ,, ,, 54 |
| 31.11.19 ... ... ... ... | Bull calf No. 63 |
| 2.3.21 ... ... ... ... ... | Heifer calf No. 80 |
| 7.6.22 ... ... ... ... ... | ,, ,, ,, 93 |
| 6.11.23 ... ... ... ... | Bull calf No. 119 |
| 14.1.25 ... ... ... ... | ,, ,, ,, 147 |
| 24.7.26 ... ... ... ... | Heifer calf No. 181 |

## SUMMARY.

St. Albans XIII. Tutsham Ballet.
BALLINEETY DUCHESS. 8 Bulls.

St. Albans XIII. Ballineety Bess.
BALLINEETY DORA. 5 Heifers.

Apsley Albert 3rd. Tutsham Ballet.
BALLINEETY COMELY. 4 Bulls.

Apsley Albert 3rd. Bonette's Bouquet.
BALLINEETY CHARMING. 9 Bulls.

Apsley Albert 3rd. Somerhill Dewdrop.
BALLINEETY CANDY. 4 Heifers.
1 Bull.

Otham Oddfellow 12th. Ballineety Dora.
BALLINEETY GIRTON. 6 Bulls.

Otham Oddfellow 12th. Ballineety Fanny.
BALLINEETY GLEE. 3 Heifers.

Otham Oddfellow 12th. Tutsham Ballet.
BALLINEETY GERTRUDE. 2 Bulls.
2 Heifers.

Blue Coat Pat. Tutsham Ballet.
BALLINEETY FAIRY. 3 Bulls.
4 Heifers.

*Record of Tutsham Ballet's Daughters.*

| Grand-Dam. | Sire. | Dam. | Progeny. |
|---|---|---|---|
| Tutsham Ballet ... | St. Albans XIII. | Ballineety Duchess | 8 Bulls |
| Tutsham Ballet ... | Apsley Albert III. | Ballineety Comely | 4 Bulls |
| Tutsham Ballet ... | Otham Oddfellow | Ballineety Gertrude | 2 Bulls<br>2 Heifers |
| Tutsham Ballet ... | Blue Coat Pat | Ballineety Fairy | 3 Bulls<br>4 Heifers |

## MISCELLANEOUS.

**Screw Worm.**—For some time past experiments have been carried out in connection with myiasis or screw worm disease. It was realised that the fly responsible for the infection of the wounds, *Chrysomyia bezziana*, being one which preferred live rather than dead meat upon which to deposit its eggs, could not be dealt with by means of the common fly traps and poisoned carcases recommended for the extinction of other "maggot flies." Also it was realised that the ordinary treatment of wounds by chemical remedies was far from satisfactory. It was reported that on some ranches Europeans were employed almost entirely on the repulsive work of dressing screw-worm-invaded wounds. It was therefore decided to attack the problem by "vaccine-therapy," and as the result of study and experiment, a vaccine has been produced. This vaccine has been "tried out" on typical cases at the veterinary laboratory and on a small scale in the field, with encouraging results. One correspondent writes: "About twelve months ago we had from you a small bottle of serum (vaccine?) for inoculating cattle affected with a sort of tropical ulcer causing quite a lot of trouble through screw worm. With ordinary treatment those sores were, if not impossible, very difficult to cure or heal up. After injecting 10 c.c. of your serum (vaccine) into the neck of the animal we found the sores healed rapidly, and in most cases were completely healed up within a week or ten days. If possible I should like to procure a 24-oz. bottle of the serum."

The writer being a well known rancher and essentially a "practical man," considerable importance may be attached to his experience, which encourages further work in this connection.

A quantity of the "vaccine" is available and will be issued for experimental use to suitable applicants, who will be asked to report fully on the results obtained.

**Treatment of Trypanosomiasis.**—The statement has been made that the treatment of "fly-struck" cattle with the medicine issued from the Veterinary Research Department renders animals sluggish and unfit for work. Since the introduction of this medicine by the writer in 1909 it has been applied to many thousands of cattle, and has enabled

farmers, transport riders and contractors to work their oxen and carry on their business operations where otherwise it would have been impossible.

If a human subject suffering from severe malaria were treated with quinine he would probably on recovery feel "sluggish" and not particularly fit for work, but this would be attributed to the malaria rather than to the quinine. The same applies to treated "fly-struck" cattle, and no reasonable stockman would expect such animals to perform a full day's work until they had recuperated from the effects of the disease, which in itself renders them anæmic, weak and easily exhausted.

It is not fair to treated animals to overwork and underfeed them, and indeed at one time it was found necessary to print on the label of the bottle containing the medicine the words, "This medicine must not be regarded as a substitute for food and water."

With regard to this charge against the treatment, a letter was written to a farmer in the Lomagundi district who has had a very long and extensive experience in the treatment of such animals. In reply he writes: "With regard to your question, I can only say that I have treated successfully a good number of animals and have never found them in any way sluggish. I have animals still working here that I treated as long ago as 1924. They are in excellent condition at the present moment and among some of the best oxen I have got. I only wish I could find again someone who holds this opinion with regard to treated animals. I would buy his beasts at a give-away figure and soon have most of them over their troubles, as I have done in the past."

**Horse-Sickness Inoculation.**—It is pleasant to record that the issue of the horse-sickness vaccine to farmers has been greater than was anticipated, showing that there are still some who realise the usefulness of horses on the farm and ranch. In only one instance have deaths as the result of inoculation been reported. On the other hand, Mr. M. C. Dedman, manager of the Rhodesian Land, Cattle and Ranching Corporation, Ltd., Shangani Ranch, writes to report that he successfully inoculated nine horses without mortality. He says: "I simply carried out your instructions to the letter, with the exception of the feeding of greenstuff. As the

horses had been getting as much greenstuff as they could eat, I continued giving 10 lbs. daily throughout the treatment. The animals were bought in the Transvaal and were imported in July. Their ages were from 3 years to 5 years. I injected the virus personally, and the animals never went off their feed; in fact, they would have eaten much more than you advised."

Mr. Dedman is to be congratulated on his success. With regard to the feeding of green food, this is not advocated, because during horse-sickness animals are very liable to colic, and green food, if perchance heated or fermented, is liable to set up intestinal troubles. In the circumstances I prefer to adhere to the dry feeding I recommend.

The one essential to success is that the animals shall be kept completely quiet and undisturbed during the inoculation reaction. In this respect the process is particularly adapted to Rhodesian conditions.

# Salisbury Experiment Station.

## FOR SALE.

### KUDZU VINE CROWNS.

A limited quantity of kudzu vine crowns will be available for sale during January at the following rates.—

| | |
|---|---|
| Large crowns ... ... ... | 6d. each. |
| Small crowns ... ... ... | 3d. each. |

Prices are carriage free to any station or siding in Southern Rhodesia.

Purchasers are recommended not to plant small crowns, except on land which can be irrigated. Orders with remittances should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury.

# Seasonal Notes on Tobacco Culture in Southern Rhodesia.

By D. D. Brown, Chief Tobacco Expert.

**Seed Beds.**—The tobacco seed beds are now well advanced, but still require regular attention and care. Should the seedlings be making slow growth or lacking the normal deep green healthy colour, an application of liquid fowl manure or nitrate of soda solution is required. Full instructions concerning the maintenance of tobacco seed beds will be found in the *Rhodesia Agricultural Journal* for September, 1926, reprinted as Bulletin No. 607.

**Field Work.**—Those lands already planted should receive special attention in regard to filling in the blanks and to the cultivation. Fertiliser, if not previously applied, should now be placed about 6 to 8 inches from each plant and well stirred up with the soil:

The field work should be proceeded with by harrowing, ridging and fertilising the unplanted lands. The accompanying illustrations of tobacco fields in Virginia, U.S.A., indicate the fine tilth considered desirable for the crop.

The ridges, it will be noted, are broad at the base and flat on top, which encourages a better balanced root system than a narrow ridge with sharp apex. On the light sandy soils in Southern Rhodesia the ridges are very frequently made too narrow and steep, with a result that they are beaten down by heavy rain storms and a certain degree of soil erosion takes place.

Before removing any plants from the seed bed they should be well watered in order to soften the soil and allow the plant to be drawn without excessive damage to the root system. Each individual seedling should be examined, and

The New Idea Transplanter common in the bright tobacco belt of Virginia and Carolina.

The transplanter in operation.

Showing state of tilth secured before planting operations are commenced. Brunswick County, Virginia.


Showing field of tobacco properly "topped" and "suckered" for maximum development of plants. Virginia, U.S.A.

if diseased or affected with root gall, should be promptly discarded and destroyed.

When transplanting the seedlings care must be taken that the tap root is not bent up when the plant is put into the ground. The holes made to receive the plants should be large enough to admit the roots, but not more than the required depth. The soil should be firmly pressed down around each seedling immediately it is planted. In order to check the work of the planters an occasional plant may be caught by the tips of the two top leaves, and when pulled upwards the seedling, if properly planted, will not leave the ground before the leaves are torn.

Cultivation must be commenced as soon as the plants are established in the field. Frequent cultivations are needed, not only to keep down weeds and grass, but also to preserve a good soil mulch, which encourages the plant to make continuous growth.

Tobacco growers have doubtless noticed the results, detrimental to the quality of leaf, when for some reason or other the growth of the plant has been retarded. Efforts should therefore be made to adopt measures which will minimise any deleterious effects caused by any controllable factors which are holding back the crop.

**Priming.**—When the plants have grown up about a foot high the bottom leaves near the ground level should be removed. All discarded tobacco leaves are best carted off the field when disease is suspected to be present in the crop, or even as a precautionary measure when no disease is apparent. This first priming should be done by pinching off the leaf close to the stem of the plant rather than by pulling the leaf upwards. The plants are primed at intervals as required until the final priming, which takes place when the crop is ready for topping. The final "priming" should leave the stalk bare for at least one foot above ground surface level. The lowest leaves left remaining on the plant should hang well clear of the ground. Special precautions should be observed, and leaves showing the first signs of white mould must be removed to arrest the spread of this prevalent disease.

**"Topping" and "Suckering."**—A very important field operation is the "topping" of the plants. The exact number of leaves which should be left on the plant cannot be definitely stated, but each plant must be treated as a unit and "topped" according to its merits. The correct number of leaves to each plant will be the number which it can carry to full maturity. A correctly topped plant will produce top leaves almost the same size as those lower down the stalk, and this is a good means of eliminating the high percentage of "shorts" in the cured tobacco. An increase in body and yield can also be secured when this operation is properly carried out.

The "topping" is often delayed beyond the time for maximum benefit to accrue. For general practical purposes the field of tobacco should be topped when from 50 to 75 per cent. of the plants are in "button" or in "flower." For example, in a large field of tobacco topping operations can well be commenced when 50 per cent. of the plants are ready, and a smaller field may be left until 75 per cent. of the plants are advanced enough for the removal of the tops; the remainder of the plants are topped when they become sufficiently advanced. One necessary precaution worthy of attention during all operations concerning priming, topping and suckering is to have the labour gang divided into two sections, one to deal only with clean healthy plants and the other to follow after and attend to those plants affected by mosaic or other diseases which may be present at the time. The portion of the plant to be removed should be bent over towards that side of the plant where the lowest of the three top leaves is found; this will obviate damaged top leaves.

Shortly after the plant has been topped the growth of "suckers" will be rapid.

All "suckers" should be removed from the plant at frequent intervals in order to save wastage of plant food and bring about maximum leaf development. The illustration of a tobacco field indicates a crop correctly topped and suckered for maximum leaf development.

**Seed Selection.**—The selection of suitable seed plants commences when the plants are about half grown, any particularly promising plants being marked and kept under observation.

In the event of the early appearances being deceptive and the development being undesirable, the plant should be topped. Diseased seed plants must be discarded. The systematic elimination of inferior seed plants and the use of seed produced only by plants conforming to a high standard is essential, not only for the welfare of the individual grower, but also for the progress of the tobacco industry as a whole.

**Harvesting and Curing.**—The harvesting of the crop now follows, and all leaf should be carefully handled in the field and during subsequent treatment. The tobacco must be ripe before it is harvested and placed in the barn; green leaf is useless. Each barn should contain leaf uniform in texture and maturity if an evenly cured product is to be secured. Overcrowding the sticks and the barn capacity should be avoided. The rate of curing should not be unduly rushed. The tobacco must be allowed to cure at the normal rate during the early stages of the process. This applies especially to the heavier bodied type of tobacco and to leaf harvested during the latter portion of the curing season. The acreage planted should not be in excess of the barn accommodation available, otherwise there exists a very great incentive to overcrowding and bad handling of the tobacco. The advantages stated to be gained by planting out a larger acreage than necessary in order to make a selection of the best leaf only are, in the majority of instances, purely theoretical. It is not a sound proposition to spend time and money on an additional acreage in order to have a certain proportion of the tobacco discarded.

A better policy would be to limit the crop strictly to the barn accommodation and other facilities and adopt such measures as would ensure the maximum results from the acreage planted. Badly diseased and damaged leaf should not be hung in the barn in place of good sound tobacco. The use of excessively high temperatures during the final stages of flue-curing is detrimental to the quality of the leaf and is therefore to be avoided whenever possible. A prolific cause for the use of extreme temperatures is an unbalanced ratio between acreage and barn accommodation. The curing is rushed in order to have each barn emptied as often as possible in order to deal with the surplus quantity of tobacco. Any temperature in excess of 160° F. cannot

be considered desirable, and, as a matter of fact, if a lesser temperature will dry out the leaf satisfactorily there is no absolute need to heat the barn up to 160° F. There are instances where specially equipped flue-curing barns, capable of drying out the leaf at 140° F., have been used. The only drawback to the immediate adoption of this specially designed curing plant is the high initial cost. The principle has, however, been proven under practical conditions, and the means of incorporating it in a less costly form would undoubtedly enhance the prospects of the tobacco grower. When handling the cured tobacco care should be exercised not to use an excessive quantity of steam or steam which is almost superheated. The neglect of suitable precautions in this respect will cause deterioration in the commercial value of the tobacco by discoloration and reduction of the essential oil content of the leaf.

**Bulking.**—The percentage of moisture required in the leaf for bulking depends entirely upon the class of tobacco being handled at the time, and no definite statement can therefore be made which complies with all individual requirements. As a rough guide, however, it may be stated that tobacco with a run of green in it can be bulked in higher condition than clear coloured leaf. Light-bodied bright leaf requires less moisture than heavier bodied and darker grades of tobacco.

All tobacco in bulks, irrespective of grade, should be placed on raised platforms which allow a free passage of air between the floor level and the under-side of the bulk. No strong light should be allowed to fall on the bulked tobacco, and all windows and skylights require to be suitably shaded. The regular inspection and turning of tobacco bulks will reduce loss through mouldy leaf and make the colour more even. It is best if each bulk contains only one class of tobacco, say, bright, medium, dark or green.

Proper facilities should be provided for grading the crop, and the floor of the grading shed should not be littered with leaf to be trampled underfoot.

**Grading.**—Adequate supervision of all grading operations is highly essential, as badly graded tobacco means a reduced price per pound.

Before tobacco is baled the leaf must be in suitable condition, and, as in the case of preparation for bulking, no definite instructions can be stated beyond that the leaf must contain sufficient moisture to prevent breakage and not enough to cause overheating and fermentation. The use of a waterproofed paper wrapped round the bale under the usual hessian covering prevents excessive drying out of the tobacco and saves a good deal of breakage arising during transportation to market.

The foregoing notes are intended to deal with the subject in a general sense only; specific information should therefore be sought in the articles on tobacco culture which have previously been published in the *Rhodesia Agricultural Journal* and which are also available in bulletin form.

**General.**—In conclusion it may be stated that the primary object of tobacco growers should be the production of quality rather than quantity. The necessity for increase in quality gradually assumes more importance with the advance of time, and is rendered more essential than ever now that the product of this Colony is in direct competition with other tobaccos offering on the open market.

The entire output cannot be expected to attain to the highest possible standard of perfection, but the general standard of a much larger percentage of the crop would be considerably improved if suitable methods of handling and more attention to detail were commonly followed.

It may be stated also that only the type of tobacco for which the soil is best suited should be grown; any compromise in this respect is a doubtful policy. It is a waste of time trying to produce heavy fire-cured leaf on a light sandy soil or flue-cured bright leaf on a stiff heavy clay. Climatic conditions also play a very important part in determining the class of tobacco which is produced. There are now old established tobacco farms in almost every section of the Colony, consequently neighbouring growers have available a very good indication of the type of tobacco which is best suited to their particular area of the Colony.

Southern Rhodesia can only become a great tobacco-producing country when well defined areas each produce a particular type of leaf best suited to the locality and which meets a definite market demand. This Colony has so far

been producing a composite average throughout the entire country, with no specialisation in regard to types by districts or smaller producing areas. During the initial stages, when the tobacco industry was in its infancy, there was no alternative but to grow one type of leaf. The experience gained through these early efforts has now demonstrated the fact that even the use of one common variety will not ensure the production of exactly similar leaf when planted throughout the entire Colony. Different types are even now being evolved by a process of acclimatisation and natural selection. If carried on along existing lines we would eventually have the establishment of types differing in varying degrees from the common standard of to-day. Time, however, is an all-important factor concerning the progress of the industry at present, therefore any opportunity of hastening the process already in operation should not be neglected.

Much good has been achieved in other countries where the systematic production and marketing by well-defined types has been adopted, and there seems to be no doubt that a similar policy could be followed with advantage in Southern Rhodesia.

A central experimental or research station cannot be expected to furnish complete data suited to the variety of soil and climatic conditions obtaining over a vast area. A certain amount of experimental work will therefore be required of each individual grower in order to ascertain which variety and type of tobacco produces optimum results under his own particular conditions.

# Conditions Governing the Hire of Government Boring Machines.

As previously mentioned in the columns of this Journal, new regulations have recently been published under Government Notice No. 546 of the 20th September, 1929, stating the conditions under which farmers and other private applicants may obtain the services of the Government drilling machines for the purpose of boring for water.

The following fuller details regarding certain sections of these regulations are published for general information, as applicants in the past have sometimes complained that regulations of this nature are not sufficiently self-explanatory and that they do not know what their commitments are likely to be if the services of one of these machines is obtained. The main difference between the new regulations and those previously in force consists in the granting of facilities for the payment of the boring charges to be extended over a period of years.

An applicant who wishes to take advantage of these facilities should make application on a separate form for a loan to cover the estimated cost of the boring charges, the necessary forms being obtainable from the Government Irrigation Engineer. Loans for this purpose are obtainable from irrigation loan funds, for which a sum of £10,000 was voted this year. These loans are granted subject to 6 per cent. interest per annum, and are repayable in annual instalments, the period of redemption varying from 5 to 15 years, dependent on the amount of the loan. In the case of a loan for boring purposes the first annual instalment is usually called for about a year after the completion of the work.

The security required for an irrigation loan is either two personal sureties from holders of immovable property in Southern Rhodesia or, failing that, the loan will be registered against the title deeds of the farm at no extra expense to the applicant.

For the information of applicants it may be stated that 40 boreholes were put down during 1928 for private applicants, and the average cost per borehole, including casing, was £126 for a depth of 118 feet, i.e., an average cost of 21s. 4d. per foot, including the cost of the casing. The cost of a borehole, however, varies considerably, dependent on the nature of the formation, the cost per foot in the year in question varying from a minimum of 8s. 4d. in sandstone to 36s. 8d. in a quartzite formation.

As detailed below, the applicant at his own cost has to supply transport for the drill and equipment from the nearest railway station or farm where the drill last operated, and also supply fuel and water.

**Classes of Government Drills (Section 13).**—The standard equipment at present supplied consists of a percussion or "jumper" drill for boring through soft formation and a rotary shot drill for boring through hard rock. Either drill may be brought into operation as required.

The rate of drilling in soft formation with the percussion drill is generally from 20 to 40 feet per day, and in rock formation with rotary drill from 2 to 8 feet per day.

**Transport (Section 15).**—The rotary and percussion drills each require a full span of 16 oxen or the equivalent to transport them. In addition to the plant itself, there are usually two full-sized wagon loads of equipment, such as tanks, casing tools, etc., and the necessary wagons and oxen must be provided by the applicant for their conveyance. A further span of from four to twelve oxen, depending on the condition of the road to be traversed, will be required for the caravan occupied by the drill foreman in charge of the plant.

A wagon is provided with some of the outfits for riding wood and water during boring operations, and when such is available it may be placed at the disposal of the applicant for transporting the equipment. The applicant is expected, whenever possible, to provide the necessary service under this heading, either with his own transport or by means of transport hired or otherwise obtained by himself. Where he is unable to do so the Government will hire or supply the necessary transport from the most convenient source and debit the cost thereof to the applicant.

**Fuel and Water (Section 16).**—The drills are driven by steam, and the amount of fuel required depends entirely on local conditions, but the applicant should be prepared to provide up to a cord of wood per day for each day the drill is actually working. The wood should be perfectly dry and of good heat-giving qualities. In the event of suitable wood not being available, coal can be used, in which case approximately five bags of 200 lbs. each will be required per working day.

During boring operations a quantity of water is required to operate the drill. Approximately 600 gallons is required for percussion drilling and up to 2,000 for shot drilling, of which 400 gallons are required for use in the boiler and should be of the purest quality obtainable. For the actual boring practically any water can be used, providing it does not contain too much mud or silt. The plant is provided with square tanks of 200 gallons capacity, which can be conveniently carried on a wagon for conveyance of water from the source of supply to the drill.

**Charges—Casing (Section 21 (d) ).**—The cost of casing varies, according to fluctuations of the market, but may be taken to range from 4s. per foot for light 5-in. diameter casing to 6s. for heavy $6\frac{1}{4}$-in. diameter casing. The size and quantity of casing inserted in any borehole is at the discretion of the drill foreman.

**General.**—An application for the hire of a drill must be submitted on the prescribed form, and it may be noted that the declaration of surety need only be completed and stamped by the applicant when he is specially requested to do so.

Since the charges are based on a daily rate, it is in the applicant's own interest to render all assistance possible for the expeditious carrying on of the operations.

The drill foremen are instructed to submit their weekly reports to the applicant for signature before forwarding them to the Irrigation Engineer, and applicants are advised to satisfy themselves that the information contained therein is correct, as discussion as to their accuracy cannot afterwards be entered into.

# Some Psychological Factors in the Feeding of Children.

By Ann Clark, M.D., Ch.B., D.P.H.,
Assistant Medical Inspector of Schools.

*We are very pleased to publish this article, which should be a great help to mothers of young Rhodesians. Dr. Clark has made a special study of this subject, and her lectures and reports have attracted a good deal of attention. We ask our farmer friends to pass their copy of the Journal on to their wives before consigning it to its usual resting place.*—Ed., *R.A.J.*

One of the commonest complaints that a doctor hears in dealing with children is that the appetite is poor, that the child refuses to eat his food or that he will eat only certain articles of diet and rejects those that are generally considered the most suitable, such as milk. The mother realises that this is a very unnatural state of things, for the normal healthy young animal of any species is endowed by nature with a strong instinct of self-preservation, which enables it, even from the time of birth, to find the most complete satisfaction in obtaining food. If, therefore, the child refuses his food, it is obvious that something has gone wrong and it is at once assumed that he is suffering from some illness and that a bottle of medicine is needed as a tonic. When these cases are carefully investigated, however, it is found that medical treatment is very rarely needed and that the condition depends on some emotional state of the child resulting from unwise training in his early years.

Difficulty is often experienced in weaning a baby because he refuses to accept new foods and violently ejects everything but the familiar milk to which he has become accustomed. In these cases it is generally found that the diet has been changed too suddenly. The baby should be accustomed at an early age to variations in the taste and consistency of his food. Long before he gives up the breast or bottle he should be used to taking water, fruit juice or thin gruel from a spoon or cup. The gruel should be made gradually thicker and vegetable purees and soups introduced, always allowing the child to become used to one thing before trying another, and there will then be little difficulty in persuading him to accept a light solid diet before he is a year or eighteen months old.

Another important point is that food should be given at regular intervals and at exactly the same time every day. The stomach is soon trained to expect and welcome food at a fixed time, but if the food is not given until later the appetite for it is lost. Nothing should be given between meals except water, or this natural rhythm becomes upset. The practice of giving sweets, bananas, biscuits or drinks of milk at odd times is often the cause of loss of appetite.

The food should be attractive as well as wholesome. It should be daintily served and well cooked. Lumpy or burnt porridge may be the starting point for a life-long aversion for this type of food. It is advisable also to give only small quantities at a time, for many children feel disgust or discouragement at the sight of a piled up plate which they may have difficulty in finishing.

The way in which food is spoken of will influence the child's feelings far more than is generally realised. If an older and admired member of the family expresses dislike for any article of food the child will at once acquire a similar dislike, and in the same way if wholesome articles, such as spinach, carrots or milk, are taken with relish by the rest of the family, the child will follow suit. It is very bad for him to hear comments on the smallness of his appetite or on his dislike or refusal of any food, as this may be the means of fixing a temporary disinclination into a permanent habit.

A child is a born imitator. Good table manners and good habits will result naturally if the child is accustomed to seeing these in others, but no amount of instructions will induce these habits if a good example is lacking. In some cases a child that is constantly being told to do this and not to do that develops a condition known as negativism, and automatically disobeys every instruction that is given.

It is a mistake to persuade and coax a child to eat. Meal times should be calm and unhurried, and no comment should be made if the food is unfinished. Many children pass through a stage when they desire above all things to be the centre of attraction, and if they find that refusing to eat will attract the desired attention and cause consternation and anxiety, they will systematically refuse their food and may even go to such lengths as vomiting or complaining of pain.

A real loss of appetite may occur in certain conditions. If a child is tired he cannot eat, and he should have a short rest before his meal and should be given only small quantities of food.

Various emotions, such as fear, anger or disappointment, may upset the appetite, and for this reason an effort should be made to make meal times as pleasant and attractive as possible and for parents to be calm and unemotional.

Approaching illness or constipation may also account for a poor appetite. In all these cases no effort should be made to force the child to eat while he is upset.

If a poor appetite persists in spite of all efforts, it is advisable to consult a physician.

# Gwelo Municipal Demonstration Stations.

## ANNUAL REPORT FOR THE SEASON 1928-29.

By D. E. McLoughlin, Assistant Agriculturist.

The work on these stations is designed to demonstrate in a practical manner the lessons learnt from experimental research work carried out on the Salisbury Experiment Station and the Gwebi Farm and serves to illustrate to what extent these practices are applicable to the Gwelo district.

It has now conclusively been shown that the various methods of cropping arable land which have been followed on these Gwelo stations apply generally to the greater part of the Midlands, and farmers of that section of the Colony may well frame their arable operations in accordance with the information which these stations have placed at their disposal.

It is gratifying to record the increasing interest shown in this work, which was evidenced by the gathering on Farmers' Day, held last March, under the auspices of the Department of Agriculture and the Municipal Council of Gwelo, when a large and representative party of farmers inspected the work in progress and listened to a number of lectures by officers of the Department.

Since its commencement the work has been ably carried out by Mr. W. Hopkins of the Municipal staff, to whom great credit is due for the valuable data thus far obtained.

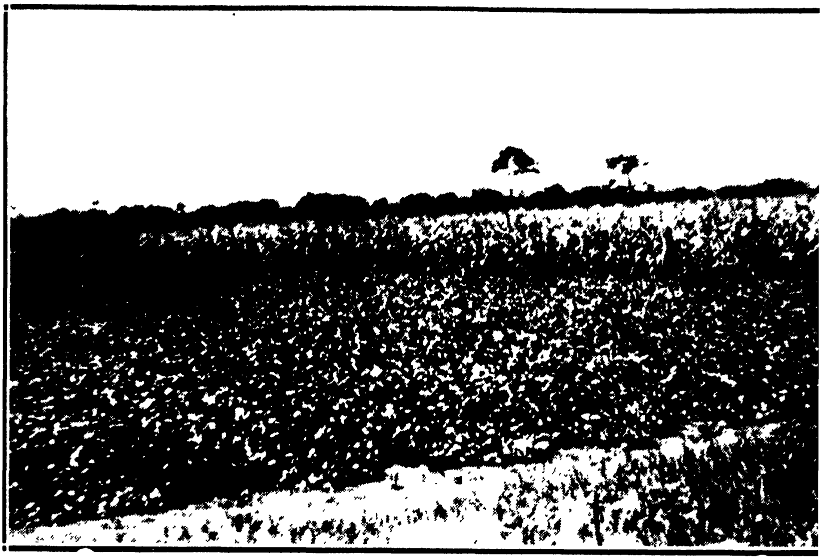
The season under review was very favourable for crop production on the red soil station, as the following rainfall records will indicate:—

## *Gwelo Gaol Records.*

| | | Total No. of days on which rain fell. | Greatest fall in one day. | Average for last 6 years, 1923-24 to 1928-29. | Average for last 29 years. |
|---|---|---|---|---|---|
| | Inches. | | Inches. | Inches. | Inches. |
| July ... | 0.03 | 1 | 0.03 | 0.01 | ... |
| August ... | ... | ... | ... | 0.01 | ... |
| September ... | ... | ... | ... | 0.17 | ... |
| October ... | 0.26 | 2 | 0.20 | 0.90 | ... |
| November ... | 4.24 | 13 | 1.97 | 2.45 | ... |
| December ... | 9.71 | 19 | 1.60 | 7.55 | ... |
| January ... | 7.73 | 20 | 1.52 | 5.83 | ... |
| February ... | 6.13 | 13 | 1.30 | 5.12 | ... |
| March ... | 5.95 | 24 | 1.01 | 3.05 | ... |
| April ... | ... | ... | ... | 0.73 | ... |
| May ... | 0.02 | 1 | 0.02 | 0.14 | ... |
| June ... | ... | ... | ... | ... | ... |
| | 34.07 | 93 | 1.97 | 25.96 | 26.55 |

## *Sand Veld Station.*

| | | | | Average for last 3 years, 1926-27 to 1928-29. |
|---|---|---|---|---|
| July ... | ... | ... | ... | ... |
| August ... | .. | ... | ... | ... |
| September ... | ... | ... | ... | 0.24 |
| October ... | 0.16 | 2 | 0.11 | 0.86 |
| November ... | 3.20 | 10 | 0.65 | 2.74 |
| December ... | 8.38 | 18 | 1.15 | 7.00 |
| January ... | 9.99 | 17 | 2.60 | 6.09 |
| February ... | 6.39 | 12 | 1.60 | 4.00 |
| March ... | 5.42 | 16 | 1.02 | 2.87 |
| April ... | ... | ... | ... | 0.35 |
| May ... | ... | ... | .. | ... |
| June ... | ... | ... | ... | ... |
| | 33.54 | 75 | 2.60 | 24.15 |



Red Soil Area, Gwelo Municipal Demonstration Station.

Fig. 1. In the foreground, velvet beans following oats. In the background, maize plus 200 lbs. bone and superphosphate per acre after velvet beans reaped.

Fig. 2.--Velvet beans to be ploughed under after ground nuts plus fertiliser, 1928-29.

Red Soil Area.
Fig. 3. Kherson oats, 1928-29, after maize plus farm manure.

Red Soil Area.
Fig. 3 (a).—Maize plus 200 lbs. bone and superphosphate per acre after velvet beans ploughed under.

An average rainfall of nearly 2 inches over normal was recorded for the months of November, December, January, February and March, which factor, coupled with the early and well distributed seasonal rains and the long growing season, proved very favourable for the production of maize, The highest yield of maize obtained, which is a record for the station, was 23.75 bags per acre, obtained in the first series of rotations with an application of seven tons farm manure per acre. The crop at no period received a check in growth through a shortage or excessive amount of rain.

The total yield of maize from four acres was 13,263 lbs. of grain, or 16.6 bags per acre. Ground nuts on the red soil yielded an average of 21 bags per acre.

## RED SOIL AREA.

**Rotation Experiments—Series "A" and "B."**—Here two four-course rotations demonstrate the effect of these alternative systems of cropping on the permanent fertility of the soil. The land in each case during the four years grows two crops of maize and one of velvet beans, and (series "A") one of ground nuts, (series "B") one of oats.

These two rotations are designed to meet the requirements of the maize and live stock farmer, or in other words, those practising a sound system of mixed farming which combines live stock with the production of cash crops.

In one of the two systems fertility is maintained by the application of seven tons of farm manure per acre every fourth year and 200 lbs, per acre phosphatic fertiliser every second year, while two hay crops—beans and oats—are grown, th stubble of which when ploughed under further enriches the land to a limited extent. Of the two crops of maize grown for grain, one, after beans reaped for hay, receives the dressing of 200 lbs. of superphosphate per acre, while the other is grown on the farm manure.

In the second system no animal manure is used, but a legume is ploughed under as green manure crop every fourth year, and the following maize crop receives a dressing of artificial fertiliser, being followed by another crop of maize without any additional treatment; ground nuts with 200 lbs. of superphosphates per acre provide the fourth crop in the cycle.

Under these two systems of cropping the fertility of the soil is being fairly well maintained, and the individual farmer can amend for himself the variety or acreage of the fourth crop in both series.

For instance, one man may desire to include an acreage of sunflower, or another may substitute entirely some other cash crop for ground nuts. Whatever crop is substituted the fertiliser dressings should not be reduced, since those used in these trials may be regarded as irreducible minimums. Similarly, where oats follow two crops of maize, some farmers may prefer to grow some cash crop instead of oats, or may prefer to substitute for oats alone Sudan grass mixed with oats, or manna and Sudan grass, or beans for hay.

The Division of the Chief Agriculturist will gladly supply cropping plans to include any crop, and for any type of soil, if, in the first instance, farmers will, when submitting their applications, describe the character of their soil, the manner in which it has previously been cropped and manured and the crops and acreages of each which it is desired to grow, the supplies of farm manure which can anually be made available and the amount of cash which can be spared each year for the purchase of artificial fertilisers.

The results in these rotation trials over the last five years —commencing from virgin soil—are as follows:—

FIG. 4.

FIG. 5.

Sand Veld Area, Season 1927 28

Fig 4 —Ground nuts (after oats plus kraal manure)

Fig 5 Maize and velvet beans plus 6 to 7 tons kraal manure per acre.

Sand Veld Area.
Fig. 6.—Maize, 1928-29, after ground nuts plus farm manure plus superphosphate.

Sand Veld Area.
Fig. 7.—Kherson oats in Rotation No. 1.

## ROTATION SERIES "A."

*Yield of Maize in bags per acre.*

| Crop. | Rainfall, 34.07 inches, 1928-29. | Rainfall, 19.64 inches, 1927-28. | Rainfall, 19.28 inches, 1926-27. | Rainfall, 19.53 inches, 1925-26. | Rainfall, 47.21 inches, 1924-25. | Average yield per acre, 5 years. |
|---|---|---|---|---|---|---|
| Velvet beans ploughed under | ... | ... | ... | ... | ... | ... |
| Maize, with 200 lbs. bone and superphosphate per acre, after velvet beans ploughed in ... | 21.15 | 9.25 | 13.0 | 21.0 | 14.5 | 15.78 |
| Maize, after maize with fertiliser ... | 18.95 | 8.0 | 12.0 | 12.0 | 13.0 | 12.79 |
| Ground nuts, with 200 lbs. superphosphate per acre, after maize | 21.6 | 13.2 | 19.0 | 23.0 | Sudan grass | 19.2 |

All maize was planted 40 inches by 18 inches apart in the rows. The standard weight of a bag of maize is 200 lbs. net, and of ground nuts 75 lbs. net. In past season maize and ground nuts were planted 29-11-28 and velvet beans 26-11-28. Each plot is half an acre in area.

## ROTATION SERIES "B."

*Yield in bags per acre.*

| Crop. | 1928-29 | 1927-28 | 1926-27 | 1925-26 | 1924-25 | Average yield per acre, 5 years. |
|---|---|---|---|---|---|---|
| Velvet beans reaped | 2.31 | 3.2 | 3.0 | ... | 4.25 | 3.2 (4 years) |
| Maize, with 200 lbs. superphosphate p.a., after beans reaped | 21.19 | 9.9 | 9.0 | 10.0 | 9.5 | 11.92 |
| Maize, with 7 tons farm manure per acre, after maize ... ... | 23.75 | 11.3 | 16.0 | 14.0 | 19.0 | 16.81 |
| Oats (Kherson), after maize plus farm manure | 604 lbs. grain | fed green | fed green | fed green | fed green | |

The weight of a bag of velvet beans is 200 lbs. net, and of oats 150 lbs. net. All maize planted 29-11-28. Each plot half an acre in area.

The above yields in the rotations afford a striking lesson when compared with the returns obtained from plots planted each year to maize on which no rotation is practised.

## MAIZE CONTINUOUS.

Half acre plot—planted 29-11-28.

*Yield in bags per acre.*

| Crop. | 1928-29 | 1927-28 | 1926-27 | 1925-26 | 1924-25 | Average yield per acre, 5 years. |
|---|---|---|---|---|---|---|
| *A.*— Maize continuous, without treatment ... | 13.16 | 4.4* fertiliser applied | 4.0 | 6.0 | 9.0 | 7.31 |
| *B.*— Maize continuous, with 150 lbs. bone and superphosphate per acre every third year ... | 15.32 fertiliser applied | 7.6 | 6.0 | 12.0 | 12.0 fertiliser applied | 10.58 |

The higher yield obtained in 1928-29 on both plots is accounted for by the fertilisers applied, in the one case (B) directly, and in the other (A) to the previous year's crop, and to the good season experienced. A study of the returns of each season compared with the records of similar trials at the Salisbury Experiment Station shows that the yields obtained from land continuously under maize are highest in those seasons with a good or normal rainfall, and that when the precipitation is either much above or much below normal there is a more serious decrease in yield on such land than on land which is under rotation of crops or which has been

*In 1927-28 the plot intended to grow *maize continuously without fertiliser* received by error the application of 150 lbs. bone and superphosphate per acre, the fertiliser being applied to this plot instead of to the plot planted to continuous maize, which should receive fertiliser every third year.

aided by green manuring. Farmers should not, therefore, be misled by the comparatively good yields obtained in 1928-29 from fertiliser alone unaided by rotation, since the risk with such a method of cropping is great, as will inevitably be revealed when unfavourable seasons occur.

During the six years of this trial plot A has received one application of 150 lbs. bone and superphosphate, and the average yield per acre is only 7.31 bags, or approximately only 50 per cent. of the average returns of 14.28 and 14.36 bags per acre in the two rotations. The profit on an average yield of 7 bags of maize an acre is at best small; that on 14 bags an acre should be fairly considerable.

The increased yield of 35 bags of maize, valued at £20, from one acre in five years was obtained at an approximate cost of five bags of fertiliser costing on an average 16s. per bag of 200 lbs., or £4, plus the cost of the green manuring or the farm manure.

Growing maize in a well planned and systematic rotation with other crops and combining with this the judicious use of manures and fertilisers ensures the permanent fertility of the soil, and since his land is the farmer's principal asset, these results should prove a striking inducement to all farmers, not only in the Midlands, but throughout the whole Colony, to adopt these methods which so frequently have been advocated and demonstrated by the Department of Agriculture. More convincing evidence of the beneficial effects of green manuring as an alternative to farm manure, coupled with moderate dressings of fertiliser, would be difficult to produce.

It is interesting to note that in the two rotations tabulated above, in which an entire legume crop ploughed under is compared with an application of seven tons farm manure per acre, the beneficial effect on the two successive crops of maize over the four-year cycle is exactly the same in so far as yield of maize is concerned.

## MAIZE VARIETY TRIALS.

Planted 40 by 18 inches apart.

*Yield in bags per acre.*

| Variety. | 1928-29 | Average yield. |
|---|---|---|
| Louisiana Hickory ... ... | 13 | 13¼ (4 years) |
| Potchefstroom Pearl ... ... | 17 | 13 (4 years) |
| Salisbury White ... ... | 17 | 11⅜ (3 years) |
| Hickory King ... ... | 14 | 11⅛ (3 years) |
| Iowa Silver Mine ... ... | ... | 7½ (1 year) |
| American White Flint ... ... | 4½ | 6 (3 years) |
| Rhode Island White Cap .. | 1 | 3 (2 years) |
| Krug Corn ... ... ... | ... | ½ (1 year) |

The average yield of the best three early maturing varieties is only 5½ bags per acre as against an average of 12¼ bags obtained with the standard Rhodesian white dent varieties. The latter varieties having conclusively proved their superiority over both the early dent and early flint varieties for this area, the experiment will therefore no longer be continued.

## LEGUMES FOR GRAIN.

| Crop. | 1928-29 | Average yield per acre. |
|---|---|---|
| | Lbs. | Lbs. |
| Velvet beans (White Stingless) ... | 484 | 711 (4 years) |
| Velvet beans (Tracey's Early Black) ... | 800 | 800 (1 year) |
| Velvet beans (Osceola) ... ... | 660 | 660 (1 year) |
| Dolichos beans (small seeded brown) ... | 724 | 729 (3 years) |
| Soya bean ... ... ... | 378 | 378 (1 year) |
| Cow pea (common) ... ... | 402 | 510 (4 years) |
| Gram ... ... ... | 1,304 | 1,304 (1 year) |
| Canadian wedge pea ... ... | 472 | 472 (1 year) |

Dolichos beans, velvet beans and cowpeas or kaffir beans have been grown with the fullest measure of success, and these constitute the best summer annual leguminous crops for stock feed and soil improvement. They can be converted into hay or ensilage, and the high protein content of the fodder and grain renders them suitable for balancing other feeds low in this constituent. They have proved their usefulness as soil improvers when either reaped or ploughed under, and provide the cheapest means of supplying nitrogen and humus to the land. The addition of humus increases the moisture retaining capacity and friability of the soil. In periods of drought and food scarcity, and even though the crop was sown to be ploughed under, it can always, if necessity arises, be utilised for feed.

**Dolichos Bean.**—This crop has proved less susceptible to disease than the velvet bean, but it is sometimes attacked by the Ootheca beetle, when the yields of grain are considerably reduced. Compared with velvet beans it produces heavier yields of both hay and silage.

The small brown-seeded variety produces the heaviest return of seed and is the variety most commonly grown. The white-seeded strains make heavier yields of fodder, but are slower to mature.

**Velvet Beans.**—The foliage of the velvet bean is seldom troubled by insect pests, but during seasons of excessive rains the leaves are sometimes attacked by a fungoid disease which causes them to fall prematurely. It has been found at the Salisbury Experiment Station that most varieties produce a large quantity of vines and leaves and a comparatively small amount of seed, but that the two kinds, namely, Osceola and Tracey's Early Black, produce seed in much larger quantities, also that they mature one month earlier than the other varieties. In districts in which the White Stingless variety matures its seed satisfactorily it is probably the best to grow, particularly when it is required for hay or ensilage.

Both dolichos and velvet beans are slow in maturing, and therefore for maximum yields should be planted early, especially in districts experiencing a short growing season and early frosts. Both can be planted in dry soil, two to three weeks before the rains commence, and the seed will not deteriorate whilst in the ground.

**Cow Peas or Kaffir Beans.**—Grown for fodder the crop yields considerably less than either dolichos or velvet beans, but it is quicker maturing, and for the latter reason is more suitable for areas experiencing very early frosts. As a partial green manuring crop it is particularly useful for "under planting" maize, especially on sandy soils, which appear best suited to it. It has been found that the common prostrate varieties, Whipoorwill, Iron and New Era, are heavier yielders of both fodder and grain than the more recent imported upright varieties.

**Wedge Pea.**—This crop has only been grown on this station for one season, and the results obtained here and at the other stations indicate that it may prove a useful fodder crop. At Salisbury it attained a height of 3 feet and yielded 1,000 lbs. of seed per acre. At Bulawayo it did exceptionally well in a moderately wet season, grown in a mixed sowing with Kherson and Kinvarra oats. Wedge pea does not suffer from mildew or leaf disease when grown as a summer crop.

**Soya Bean.**—Thus far the crop has not proved very satisfactory. Average yields of grain are too low to recommend it as a commercial crop at present. Yields of fodder and hay do not compare favourably with either dolichos or velvet beans. The O-too-tan variety has so far given the best results. It has been noticed that soya beans do not produce root nodules very freely when grown on land lacking in humus or when grown on the same land producing nodules on dolichos and velvet beans, which would indicate that a particular bacterium suitable for the soya bean is absent in the average Rhodesian soils. A soya bean culture has recently been introduced, and it is hoped that the inoculation of the soil with a suitable bacterium will render the crop more profitable to grow.

**Gram.**—Grown here for the first time this season, the yield of grain proved exceptionally good, but the crop needs further trial before it can be recommended.

## GROUND NUTS (SPANISH BUNCH).

*Yield in bags per acre.*

| Season. | Treatment. | Yield. | Average yield, 5 years. |
|---|---|---|---|
| 1924-25 ... | No fertiliser | 14.0 | ... |
| 1925-26 ... | In rotation A. | 23.0 | ... |
| 1926-27 ... | ,, | 19.0 | ... |
| 1927-28 ... | (1) ,, | 13.2 | ... |
| | (2) Plus 200 lbs. superphosphates per acre | 16.2 | 18.2 |
| 1928-29 ... | (1) In rotation A. | 21.6 | ... |
| | * (2) After dolichos beans reaped | 20.6 | ... |
| 1928-29 ... | * Virginia bunch (after dolichos beans reaped) | 13.5 | ... |

The best results are obtained with this crop when it is grown in a systematic rotation with maize or tobacco, including a green manuring crop ploughed under once in four years. Ground nuts demand a good supply of organic matter in the soil and respond well to phosphatic fertilisers applied direct to the crop.

It has been conclusively shown on all the experiment stations of this Colony that higher yields are obtained from a closer spacing than from 36 inches between the rows, and that the most satisfactory distance for field planting is 20 to 24 inches between the rows and 6 inches between plants. The desired distance is obtained by setting an ordinary maize planter at 40-42 inches and by splitting the rows. This spacing permits of field cultivation under ordinary farming conditions.

The "runner" types or prostrate varieties of ground nuts are usually heavier yielders of nuts than the bunch varieties, but on account of the larger number of immature nuts and the extra cost of harvesting them, the bunch varieties are usually recommended in preference for commercial cultivation.

*Grown in a variety test. Both varieties received the same treatment.

## MISCELLANEOUS CROPS.

| Crop. | 1928-29 | 1927-28 | 1926-27 | 1924-25 | Average yield per acre. |
|---|---|---|---|---|---|
| | Bags. | Bags. | Bags. | Bags. | Bags. |
| Sunflower (Large Black) | 5.4 | 5.2 | 14 | 5.2 | 7.5 |
| Sunflower (Small Black) | 7.0 | ... | ... | ... | 7.0 |
| | Lbs. | Lbs. | Lbs. | Lbs. | Lbs. |
| Kaffir Corn ... | No record | 340 | 600 | 120 | 360 |
| Linseed (W.F.) ... | 234 (damaged by ants) | (destroyed by ants) | 400 | 232 | 289 |
| Boer Manna ... | 1,140 | ... | ... | 448 | 794 |
| Oats (Kherson) ... | 604 | ... | ... | ... | 604 |

Tepary beans, haricot beans and kaffir corn were a failure owing to the excessive rains. Sudan grass provided only one cutting and was affected by leaf disease. These crops have been found to do best in a moderately dry season. Ants were responsible for a much reduced yield of linseed.

### SAND VELD AREA.

The season under review was not a favourable one for this station, the soil of which is shallow and very badly drained. The greater number of the plots lie in saucer shaped depressions, and until these can be levelled out by constant working it is not anticipated that satisfactory returns will be obtained in seasons of unusually heavy rainfall. The average sand veld land on most farms is deeper, more fertile and better drained, and farmers should easily be able to surpass the yields generally obtained on this station.

**Maize.**—The highest yield of maize recorded was 9⅝ bags, obtained after ground nuts plus farm manure and fertiliser, but the season has demonstrated that crops other than maize can be grown more successfully in wet years on this type of soil, and that they provide a useful insurance should the maize crop fail. It is a significant fact that the best return of ground nuts, namely, 27 bags an acre, was obtained on this sand veld soil, as against a best yield of 21.6 bags per acre on the red soil area.

The total weight of maize reaped was 38 bags or 4.75 bags per acre from eight acres.

In the season 1927-28 the average yield per acre for 11 plots was 5.1 bags per acre. Despite the severe drought that season, one plot of maize dressed with 200 lbs. superphosphates per acre, after dolichos beans ploughed under in 1926-27, yielded at the rate of 7.06 bags per acre.

The season 1926-27 was fairly normal, though the total rainfall was under 20 inches. In that season the highest yield of maize on any plot was 15 bags per acre, and the average of five plots treated with fertiliser or farm manure was 12.7 bags per acre (higher than the average of the red soil station that year). These figures, compared with those of the season under review, form a better guide to the possibilities of maize growing on the better drained sand veld soils of this Colony.

**Rotation Experiments.**—Two four-course rotations are being demonstrated, the land in each case during the four years growing two crops of maize, one of ground nuts and one of oats. In Series No. 1 200 lbs. of bone and superphosphate per acre is applied every fourth year to the maize crop, while in Series No. 2 it receives six tons farm manure per acre over the same period.

Ground nuts receive 200 lbs. of superphosphates in Series No. 2 and six tons of farm manure in Series No. 1. In addition to the above treatment all plots in both series receive, when thought essential, an additional dressing of six tons farm manure per acre.

It may again be pointed out, however, that the land on this station, though admittedly very low in fertility, suffers more on account of bad draining than from actual poverty. Low fertility is being overcome, but the lack of drainage through the impervious sub-soil is a difficulty whenever the rainfall is above normal.

Commencing in the season 1929-30, maize in Series No. 1 is under-planted with legumes after the last cultivation of the maize in January, and in Series No. 2 only half the maize is under-sown with legumes. Prior to 1929 various legumes, such as soya beans, dhal, wedge pea, gram, velvet beans and Jack beans, were tested for under-sowing. The only one prov-

ing satisfactory has been the kaffir bean or cow pea, and most of the plots have not yet benefited by this under-sowing owing to failure of the other legumes experimented with.

## SERIES No. 1.

*Yield in bags per acre.*

| Crop. | 1928-29. | 1927-28. | 1926-27. | Average yield. |
|---|---|---|---|---|
| Maize + 200 lbs. bone and superphosphate per acre, after ground nuts ... ... ... | 4.65 | 6.5 | 15 | 8.72 |
| Maize, after maize + fertiliser ... | 5.10 | 5.6 | 11 | 7.25 |
| Oats (Kherson), after maize ... | 580 lbs. | ... | ... | ... |
| Ground nuts + 6 tons farm manure per acre, after oats ... | 7 | 10.8 | 20 | 12.6 |

In 1926-27 all plots in this rotation received a dressing of six tons farm manure per acre. In 1927-28, maize after maize + fertiliser received six tons farm manure per acre.

## SERIES No. 2.

| Crop. | 1928-29. | 1927-28. | 1926-27. | Average yield. |
|---|---|---|---|---|
| Maize, after ground nuts + fertiliser | 3.8 | 3.2 | 10.5 | 5.8 |
| Maize + 6 tons farm manure per acre, after maize ... ... | 4.85 | 6.9 | 13.5 | 8.42 |
| Oats (Kinvarra), after maize + farm manure... ... ... | 372 lbs. | ... | ... | 372 lbs. |
| Ground nuts + 200 lbs. superphosphate per acre ... ... | 7.6 | 9.3 | 16 | 11 |

In 1928-29 all plots except the ground nuts received six tons of farm manure per acre. The ground nuts received only the usual dressing of fertiliser.

Maize after ground nuts + six tons farm manure + fertiliser, 9⅝ bags.

## MAIZE FOLLOWING GREEN MANURE CROPS.

Second crop of maize.

| Treatment. | 1928-29 | 1927-28 | Average for 2 years. |
|---|---|---|---|
| | Bags. | Bags. | Bags. |
| After velvet beans reaped ... | 4 31 | 4.21 | 4.26 |
| After velvet beans ploughed under | 4.57 | 5.47 | 5.02 |
| After dolichos beans reaped .. | 5.45 | 5.13 | 5.29 |
| After dolichos beans ploughed under | 3.60 | 7.06 | 5.30 |
| After cow peas reaped... ... | 3.30 | 4.60 | 3.95 |
| After cow peas ploughed under ... | 5 46 | 4.56 | 5.01 |

Better results would probably have been obtained had the green manure crops themselves been fertilised.

## GROUND NUTS (SPANISH BUNCH).

*Yield per acre in bags of 75 lbs.*

| Treatment. | 1928-29 | 1927-28 | 1926-27 | 1925-26 | 1924-25 |
|---|---|---|---|---|---|
| | | Average of all plots | Average of all plots | Average of all plots | Average of all plots |
| Plus 100 lbs. per acre bone and superphosphates ... | 27.0 | ... | ... | ... | ... |
| Plus 150 lbs. per acre bone and superphosphates ... | 19.0 | ... | ... | ... | ... |
| Plus 200 lbs. per acre bone and superphosphates ... | 16.0 | ... | ... | ... | ... |
| In 4-course rotation with maize and oats plus fertiliser ... | 7.6 | ... | .. | ... | ... |
| In 4-course rotation with maize and oats plus farm manure ... ... | 7.0 | ... | ... | ... | ... |
| Average yield per acre of all plots under ground nuts | 15.3 | 10.0 | 17.3 | 11.0 | 10.8 |

Irregularity of yield in 1928-29 in the fertiliser trials is here again due to some plots being better drained than others, and the results afford no information of value in respect to the relative applications of fertiliser.

It is of interest and importance to record that poor and shallow as the soil of this station is it yet produces excellent crops of dolichos beans, velvet beans and kaffir beans when sown as pure stands for fodder, grain or green manuring. Sunflower and maize and dolichos beans for silage have also given good yields, and these facts indicate that even on such poor and wet soils as these the mixed farmer who sets himself to do so, can produce a number of valuable food crops for his live stock.

# Seeds for Sale, Gwebi Farm.

| | | s. | d. |
|---|---|---|---|
| Boer Manna ... ... ... ... ... ... ... ... ... ... ... ... ... | per lb. | 0 | 4 |
| Sunflower Seed (Large Black) ... ... ... ... ... | 100 lbs. | 16 | 0 |
| Sweet Potato Slips ... ... ... ... ... ... ... ... ... ... ... | per bag | 6 | 0 |
| Napier Fodder Roots ... ... ... ... ... ... ... ... ... ... | per bag | 6 | 0 |
| Edible Canna ... ... ... ... ... ... ... ... | per 100 "tubers" | 9 | 0 |

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

# What we ask of our Agricultural Department.

*From a correspondent*:

"I would be much obliged if you would supply me with information on the following points:—

1. Classify into their different plant families the plants that come under the heading of 'vegetables.'
2. The different methods of propagating the different 'vegetable plants.'
3. Classify them into 'summer' and 'winter' crops.
4. Give the time required for each plant from the time of planting to when it is ready to be harvested.
5. Make lists of those plants that have to be transplanted and those that have a perennial habit.
6. Give the rate and method of sowing the different plants.
7. Give the average yields and methods of harvesting the different crops.
8. Give the method of storing and preparing for market the different vegetable plants.
9. The manurial treatment for the different plants.
10. Give the diseases and pests and methods of control.

If there are any points that I have missed, I would be very glad if you will add them as well."

# Southern Rhodesia Weather Bureau.

## OCTOBER, 1929.

**Pressure.**—The mean barometric pressure was generally below normal, being lowest at Mazunga with 0.027 in. below normal, and highest at Fort Victoria with 0.005 in. below normal.

Pressure variations during the month were abnormally low; the equatorial low was unusually active throughout the month, and there was a marked absence of southerly lows.

The southerly highs appeared frequently, but were very weak, and appeared to be travelling far to the south.

Only one high of importance was recorded, but this, although weak, passed along the south coast at the end of the month, when the pressure distribution was favourable, and was accompanied by fairly general showers.

The presence of a semi-permanent high off Beira and the high latitudes of the southerly highs are similar to last year.

**Temperature.**—The temperatures during the month were abnormally high in most areas. The mean temperature varied from 4.6° F. above normal at Empandeni to 1.6° F. below normal at Feira.

The mean maximum temperature was high, varying from 4.8° F. above normal at Fort Victoria to 0.2° F. above normal at Riverdene North.

The mean minimum temperatures were also high, varying from 5.0° F. above normal at Holly's Hope to 1.5° F. above normal at Juliasdale.

The relative humidity was generally below normal.

**Rain Periods.**—No rain of importance was recorded until the 22nd, when scattered showers fell in Mashonaland. On the 23rd there were scattered showers in Mashonaland, and from the 24th to 27th isolated showers were recorded. On the 28th showers were general, and on the 30th scattered showers fell in Mashonaland, with isolated showers on the 31st.

The schedule of rainfall follows:—

# RAINFALL.

| Station. | 1929. Sept. | 1929. Oct. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone A.:** | | | | |
| Bubi— | | | | |
| Bembesi Railway ... | ... | ... | ... | .96 |
| Glenarton ... | ... | ... | ... | .99 |
| Inyati ... | ... | .26 | .38 | 1.02 |
| Judsonia ... | ... | .16 | .16 | n.s. |
| Martha Farm ... | .. | ... | .09 | .88 |
| Nduba Farm ... | ... | .60 | .60 | n.s. |
| Shangani Estate ... | ... | .25 | .37 | .94 |
| Bulalima-Mangwe— | | | | |
| Centenary ... | .10 | ... | ... | 1.27 |
| Kalaka ... | ... | ... | ... | .94 |
| Riverbank ... | .01 | .56 | .58 | .96 |
| Solusi Mission ... | ... | .47 | .47 | 1.00 |
| Bulawayo— | | | | |
| Fairview Farm ... | .01 | ... | .01 | .91 |
| Keendale ... | ... | .44 | .44 | .90 |
| Lower Rangemore ... | ... | ... | ... | .97 |
| Observatory ... | ... | .18 | .23 | 1.00 |
| Waterworks ... | ... | .11 | .11 | .96 |
| Gwelo— | | | | |
| Brockenhurst .. | ... | .08 | .08 | n.s. |
| Frogmore ... | ... | ... | .10 | n.s. |
| Gwelo Gaol ... | ... | .03 | .10 | 1.09 |
| Riversdale Estate ... | ... | ... | ... | 1.20 |
| Somerset Estate ... | ... | .11 | .11 | 1.04 |
| Insiza— | | | | |
| Orangedale ... | ... | .58 | .58 | 1.16 |
| Shangani ... | ... | ... | .02 | .96 |
| Thornville ... | ... | .24 | .24 | 1.03 |
| Nyamandhlovu— | | | | |
| Gwaai Reserve ... | ... | .75 | .75 | 1.15 |
| Gwaai Siding ... | ... | .19 | .19 | n.s. |
| Naseby ... | ... | .18 | .18 | .91 |
| Nyamandhlovu Railway ... | ... | .. | ... | .94 |
| Sebungwe— | | | | |
| Gokwe ... | ... | ... | ... | 1.17 |
| Umzingwane— | | | | |
| Springs ... | ... | .14 | .29 | 1.00 |
| Wankie— | | | | |
| Dett ... | .. | .22 | ... | 1.13 |
| Matetsi Railway ... | ... | ... | ... | 1.23 |
| Ngamo Railway ... | ... | .48 | .48 | 1.19 |
| Rosslyn ... | ... | ... | ... | n.s. |
| Sukumi ... | ... | .11 | .11 | 1.26 |
| Tom's Farm ... | ... | .52 | .54 | n.s. |
| Victoria Falls ... | ... | .20 | .20 | n.s. |
| Victoria Falls Railway ... | ... | .23 | .23 | 1.15 |
| Wankie Hospital ... | ... | .08 | .08 | .95 |

## RAINFALL—*(Continued)*.

| Station. | 1929. Sept. | 1929. Oct. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone B.:** | | | | |
| Belingwe— | | | | |
| Bickwell ... | ... | .22 | .57 | 1.31 |
| Sovelele ... | ... | .60 | 1.02 | 1.27 |
| Tamba ... | .45 | 1.22 | 1.67 | 1.18 |
| Wedza .. | .85 | ... | 1.42 | 1.42 |
| Bulalima-Mangwe— | | | | |
| Bruwapeg ... | ... | ... | ... | 1.07 |
| Empandeni ... | ... | 1.04 | 1.04 | 1.19 |
| Fallowfields ... | ... | .38 | .38 | n.s. |
| Garth ... | .07 | ... | .12 | 1.40 |
| Maholi ... | ... | .93 | .93 | 1.28 |
| Retreat ... | .12 | 1.72 | 1.84 | 1.23 |
| Sandown ... | .31 | .87 | 1.18 | 1.30 |
| Semokwe Reserve ... | ... | .30 | .39 | ... |
| Tjankwa ... | .12 | .40 | .52 | 1.34 |
| Tjompani ... | .06 | .29 | .31 | 1.29 |
| Chibi— | | | | |
| Bubye ... | .25 | .01 | .26 | .85 |
| Mtendelende ... | .17 | ... | .43 | 1.23 |
| Nuanetsi Homestead ... | .. | .20 | .20 | .88 |
| Nuanetsi N.C. ... | ... | 1.21 | 1.21 | n.s. |
| Gwanda— | | | | |
| Gwanda Gaol ... | ... | .25 | .29 | 1.16 |
| Limpopo ... | ... | ... | ... | .67 |
| Mazunga ... | ... | 3.06 | 3.27 | .91 |
| Mtetengwe ... | .02 | 1.10 | 1.12 | .68 |
| Tuli ... | .02 | 1.21 | 1.23 | .79 |
| Insiza— | | | | |
| Albany ... | ... | .74 | .81 | 1.24 |
| Filabusi ... | ... | ... | .11 | 1.19 |
| Fort Rixon ... | ... | .17 | .17 | 1.29 |
| Inyezi ... | ... | .12 | .45 | 1.21 |
| Lancaster ... | ... | ... | .11 | 1.26 |
| Scaleby ... | ... | .12 | .30 | n.s. |
| Wanezi Mission ... | ... | ... | .27 | n.s. |
| Matobo— | | | | |
| Bon Accord ... | .10 | .11 | .21 | n.s. |
| Fort Usher ... | .04 | ... | .08 | n.s. |
| Holly's Hope ... | ... | .24 | .25 | 1.20 |
| Longsdale ... | ... | 2.87 | 2.87 | n.s. |
| Matopo Mission ... | .43 | .43 | .97 | 1.47 |
| Mtshabezi Mission ... | .08 | .05 | .16 | 1.23 |
| Rhodes Matopo Park ... | .10 | 1.90 | 2.04 | 1.32 |
| Umzingwane— | | | | |
| Balla Balla ... | .14 | .07 | .21 | 1.33 |
| Essexvale ... | ... | .09 | .09 | 1.30 |
| Hope Fountain ... | .01 | .09 | .10 | 1.42 |

## RAINFALL—(*Continued*).

| STATION. | 1929. Sept. | 1929. Oct. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **ZONE C.:** | | | | |
| Charter— | | | | |
| Bushy Park ... | ... | ... | ... | 1.34 |
| Enkeldoorn ... | ... | .16 | .32 | 1.38 |
| Marshbrook ... | ... | .82 | .99 | 1.33 |
| The Range ... | ... | 1.28 | 1.52 | 1.43 |
| Vrede ... | ... | ... | .15 | 1.33 |
| Chilimanzi— | | | | |
| Beacon Hill ... | ... | .10 | .10 | 1.45 |
| Central Estates ... | ... | .36 | .36 | 1.40 |
| Fourie's Post ... | ... | ... | ... | 1.23 |
| Orton's Drift ... | ... | ... | ... | 1.40 |
| Sebakwe Post ... | ... | ... | ... | 1.33 |
| Umvuma Railway ... | ... | ... | ... | 1.29 |
| Gwelo— | | | | |
| Cross Roads ... | ... | .04 | .04 | 1.23 |
| Delano Estate ... | .03 | ... | .09 | n.s. |
| East Clare Ranch ... | ... | .14 | .24 | 1.30 |
| Forestvale ... | ... | .60 | .60 | n.s. |
| Globe and Phœnix Mine ... | ... | .34 | .43 | 1.28 |
| Lannes Farm ... | ... | ... | ... | n.s. |
| Lalapanzi ... | ... | .19 | .19 | 1.43 |
| Lyndene ... | ... | ... | .13 | 1.20 |
| Woodendhove ... | ... | .40 | .40 | 1.34 |
| Wold Farm ... | ... | .33 | .44 | n.s. |
| Hartley— | | | | |
| Ardgowan ... | ... | ... | ... | 1.44 |
| Balwearie ... | ... | ... | .01 | 1.66 |
| Battlefields ... | ... | .22 | .22 | 1.31 |
| Beatrice ... | ... | .32 | .32 | 1.49 |
| Carnock ... | ... | 1.09 | 1.13 | 1.44 |
| Cromdale ... | ... | .59 | .81 | 1 43 |
| Currandooley ... | ... | .20 | .24 | n.s. |
| Eiffel Blue Mine ... | ... | ... | .02 | 1.05 |
| Elvington ... | ... | .32 | .36 | 1.42 |
| Gatooma ... | ... | .23 | .23 | 1.46 |
| Cotton Breeding Station ... | ... | .32 | .32 | n.s. |
| Gowerlands ... | ... | .56 | .56 | 1.37 |
| Handley Cross ... | ... | .17 | .22 | n.s. |
| Hartley Gaol ... | ... | .79 | .98 | 1.42 |
| Hopewell ... | ... | .38 | .50 | 1.46 |
| Jenkinstown ... | ... | ... | ... | 1.43 |
| Maida Vale ... | ... | .34 | .34 | 1.28 |
| Meadowlands ... | ... | .84 | .94 | n.s. |
| Nyadgori ... | ... | .68 | .68 | 1.43 |
| Pulham ... | ... | 2.06 | 2.21 | 1.51 |
| Ranwick ... | ... | .26 | .32 | 1.41 |
| Sunny Bank ... | ... | .21 | .26 | n.s. |
| Thorndyke ... | ... | .93 | .93 | 1.31 |

## RAINFALL—(*Continued*).

| Station. | 1929. Sept. | 1929. Oct. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone C.—(Continued)** | | | | |
| Lomagundi— | | | | |
| Argyle ... | ... | 1.30 | 1.30 | 1.34 |
| Baguta ... | ... | 1.27 | 1.27 | 1.37 |
| Between Rivers ... | ... | .93 | 1.38 | n.s. |
| Citrus Estate ... | ... | 1.30 | 1.42 | 1.28 |
| Dalston ... | ... | ... | ... | n.s. |
| Strathdon ... | ... | 2.41 | 2.57 | n.s. |
| Darwendale ... | ... | 1.92 | 1.92 | 1.35 |
| Dedsi ... | ... | ... | .06 | n.s. |
| Dingley Dell ... | ... | .43 | .43 | 1.15 |
| Gambuli ... | ... | 1.61 | 1.74 | 1.46 |
| Kapiri ... | ... | .38 | .64 | 1.28 |
| Kashao ... | ... | .24 | .24 | n.s. |
| Kenidia ... | ... | 1.71 | 1.75 | n.s. |
| Mafoota ... | ... | .97 | 1.20 | 1.24 |
| Maningwa ... | ... | 2.01 | 2.15 | 1.34 |
| Miami ... | ... | .44 | .60 | n.s. |
| Mica Field ... | ... | .02 | .17 | 1.13 |
| Montrose ... | ... | 1.55 | 1.57 | 1.25 |
| Mpandegutu ... | ... | 1.34 | 1.80 | 1.37 |
| Msina ... | ... | ... | .08 | n.s. |
| Mukwe River Ranch ... | ... | 1.52 | 1.52 | 1.26 |
| Nyapi ... | ... | 1.85 | 2.16 | 1.20 |
| Nywari ... | ... | 2.01 | 2.10 | 1.20 |
| Nyati ... | ... | ... | ... | 1.11 |
| Palm Tree Farm ... | ... | 1.46 | 1.58 | 1.34 |
| Pendennis ... | ... | .37 | .44 | n.s. |
| Raffingora ... | ... | .66 | .91 | 1.26 |
| Renardia ... | ... | 2.20 | 2.48 | 1.26 |
| Richmond ... | ... | ... | .10 | .97 |
| Robbsdale ... | ... | .04 | .04 | n.s. |
| Romsey ... | ... | ... | ... | 1.23 |
| Silaler Estate ... | ... | 1.32 | 1.69 | 1.28 |
| Sinoia ... | ... | .97 | .97 | 1.35 |
| Sipolilo ... | ... | ... | ... | 1.34 |
| Umvukwe Ranch ... | ... | .02 | .05 | 1.37 |
| Woodleigh ... | ... | 2.54 | 2.91 | 1.31 |
| Yeanling ... | ... | 1.43 | 1.43 | 1.28 |
| Zebra Vlei ... | ... | ... | ... | 1.32 |
| Marandellas— | | | | |
| Rocky Spruit ... | ... | 1.25 | 1.25 | 1.63 |
| Mazoe— | | | | |
| Pembi Ranch ... | ... | .17 | .17 | n.s. |
| Salisbury— | | | | |
| Avondale (Broadlands) ... | ... | .85 | .88 | 1.40 |
| Ballineety ... | ... | .59 | 1.22 | 1.57 |
| Botanical Experiment Station | ... | .84 | .87 | 1.37 |
| Bromley ... | ... | 1.33 | 1.50 | 1.44 |
| Cleveland Dam ... | ... | .44 | .46 | 1.37 |

## RAINFALL—(*Continued*).

| Station. | 1929. | | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| | Sept. | Oct. | | |
| **Zone C.—(Continued)** | | | | |
| **Salisbury (continued)—** | | | | |
| Forest Nursery ... | ... | .54 | .54 | 1.42 |
| Gwebi ... | ... | .62 | .99 | 1.41 |
| Salisbury Agricultural Dept. | ... | .85 | .87 | 1.40 |
| Sebastopol ... | ... | 1.24 | 1.42 | 1.45 |
| Stapleford ... | ... | 1.35 | 1.41 | 1.47 |
| Tobacco Experiment Station | .65 | 1.49 | 2.14 | 2.21 |
| Western Commonage ... | ... | 1.28 | 1.98 | 1.46 |
| **Sebungwe—** | | | | |
| Sikombela ... | ... | .84 | .84 | 1.42 |
| Wolverley ... | ... | ... | ... | 1.35 |
| **Zone D. :** | | | | |
| **Darwin—** | | | | |
| Cullinan's Ranch ... | ... | ... | ... | .51 |
| Mount Darwin ... | ... | ... | .04 | 1.21 |
| Rusambo ... | ... | .13 | .13 | n.s. |
| **Inyanga—** | | | | |
| Inyanga ... | .08 | 1.36 | 1.44 | 1.48 |
| Juliasdale ... | .03 | 1.06 | 2.11 | 1.67 |
| Rhodes Estate ... | ... | ... | .78 | 1.54 |
| **Makoni—** | | | | |
| Ardlamont ... | ... | ... | .40 | n.s. |
| Eagle's Nest ... | ... | 1.40 | 1.54 | 1.32 |
| Mayo Ranch ... | ... | .19 | .19 | ... |
| Wensleydale ... | ... | .80 | 1.13 | 1.23 |
| **Mazoe—** | | | | |
| Argyle Park ... | ... | .36 | .41 | .51 |
| Atherstone ... | ... | ... | .10 | 1.12 |
| Bellevue ... | ... | .57 | 1.89 | 1.22 |
| Bindura ... | ... | .19 | .40 | 1.32 |
| Ceres ... | ... | .34 | .63 | 1.42 |
| Chipoli ... | ... | ... | ... | 1.27 |
| Citrus Estate ... | ... | .63 | 1.27 | 1.28 |
| Craigengower ... | ... | .12 | .39 | 1.24 |
| Dandejena ... | ... | .34 | .34 | n.s. |
| Donje ... | ... | ... | .14 | n.s. |
| Frogmore ... | ... | ... | .08 | 1.11 |
| Glen Divis ... | ... | ... | .44 | 1.29 |
| Glen Grey ... | ... | .13 | .58 | 1.05 |
| Great B ... | ... | 1.51 | 1.84 | 1.19 |
| Hinten ... | ... | ... | ... | .41 |
| Horta ... | ... | .02 | .02 | 1.28 |
| Kilmer ... | ... | ... | .32 | 1.27 |
| Kingston ... | ... | .04 | .60 | 1.42 |
| Maienza ... | ... | .27 | 1.01 | 1.19 |
| Mazoe Dam ... | ... | 1.15 | 1.43 | 1.43 |

## RAINFALL—*(Continued).*

| Station. | 1929. Sept. | 1929. Oct. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone D.—(Continued)** | | | | |
| Mazoe (continued)— | | | | |
| Mgutu ... | ... | 1.07 | 1.48 | 1.29 |
| Muripfumba ... | ... | ... | .54 | 1.09 |
| Omeath ... | ... | .99 | .99 | 1.25 |
| Pearson Settlement ... | ... | .94 | 1.26 | 1.19 |
| Riversdale Estate ... | ... | ... | ... | .86 |
| Ruia ... | ... | ... | ... | 1.40 |
| Rustington ... | ... | .34 | .71 | 1.10 |
| Shamva Mine ... | ... | .26 | .85 | 1.32 |
| Stanley Kop ... | ... | .48 | .87 | 1.23 |
| Sunnyside ... | ... | ... | .40 | 1.30 |
| Teign ... | ... | .10 | .27 | 1.34 |
| Usk ... | .10 | .17 | .27 | 1.42 |
| Virginia ... | ... | .08 | .31 | 1.22 |
| Visa ... | ... | ... | ... | n.s. |
| Woodlands ... | ... | ... | .01 | 1.30 |
| Zombi Farm ... | ... | .33 | .77 | 1.40 |
| Mrewa— | | | | |
| Maryland ... | ... | 2.92 | 3.00 | 1.32 |
| Montclair ... | ... | 1.92 | 2.18 | n.s. |
| Mrewa ... | ... | .90 | 1.23 | 1.38 |
| Nyaderi Mission ... | ... | ... | .27 | 1.22 |
| Selous Nek ... | ... | .19 | .19 | 1.32 |
| Mtoko— | | | | |
| Makaha ... | ... | .05 | .05 | 1.25 |
| Mtoko (N.C.) ... | ... | ... | .25 | 1.10 |
| Rukore ... | ... | ... | ... | n.s. |
| Salisbury— | | | | |
| Arcturus ... | ... | 1.20 | 1.68 | 1.45 |
| Chindamora Reserve ... | ... | .39 | .54 | 1.30 |
| Glenara ... | ... | ... | .13 | 1.24 |
| Goromonzi ... | ... | 2.49 | 2.66 | 1.50 |
| Hatcliffe ... | ... | .47 | .47 | 1.32 |
| Hillside (Bromley) ... | ... | 2.46 | 2.69 | 1.38 |
| Kilmuir ... | ... | .85 | .87 | 1.48 |
| Meadows ... | ... | 1.18 | 1.25 | 1.50 |
| Selby ... | ... | 1.65 | 1.90 | 1.20 |
| Springs ... | ... | 1.02 | 1.26 | 1.75 |
| Teviotdale ... | ... | .42 | .42 | n.s. |
| Vainona ... | ... | .48 | .53 | 1.31 |
| **Zone E.:** | | | | |
| Belingwe— | | | | |
| Belingwe (N.C.) ... | ... | .24 | .63 | 1.32 |
| Doro ... | .05 | .07 | .42 | 1.40 |
| Shabani ... | ... | .24 | .24 | 1.52 |

## RAINFALL—*(Continued)*.

| Station. | 1929. Sept. | Oct. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE E.—(Continued) | | | | |
| Bikita— | | | | |
| Angus Ranch ... | ... | ... | .01 | 1.35 |
| Bikita ... | ... | 1.00 | 1.89 | 2.24 |
| Devuli Ranch ... | ... | ... | ... | 1.19 |
| Pamushana ... | ... | 1.37 | 1.37 | 2.16 |
| Charter— | | | | |
| Buhera ... | ... | .82 | .82 | 1.96 |
| Chibi— | | | | |
| Chibi ... | ... | .19 | .42 | 1.32 |
| Lundi ... | ... | ... | 1.53 | 1.20 |
| Mpapas ... | ... | .98 | 1.32 | 1.20 |
| Chilimanzi— | | | | |
| Allanberry ... | ... | .97 | 1.15 | 1.58 |
| Driefontein ... | ... | .16 | .24 | 1.54 |
| Felixburg ... | ... | .78 | .78 | 1.70 |
| Grootfontein ... | ... | ... | ... | 1.64 |
| Induna Farm ... | ... | .03 | .06 | 1.78 |
| Mtao Forest ... | ... | .06 | .22 | 1.68 |
| Mukowries ... | ... | .56 | .74 | n.s. |
| Thornhill ... | ... | ... | .06 | n.s. |
| Gutu— | | | | |
| Alheit Mission ... | ... | 1.15 | 1.15 | 1.31 |
| Devuli Store ... | ... | .83 | .85 | 1.83 |
| Eastdale Estates ... | ... | 2.33 | 2.45 | 1.79 |
| Gutu (N.C.) ... | ... | ... | .26 | 1.70 |
| Glenary ... | ... | 2.40 | 2.56 | 1.46 |
| Gwelo— | | | | |
| Glencraig ... | ... | .81 | .85 | 1.16 |
| Partridge Farm ... | ... | .27 | .29 | 2.00 |
| Sheep Run Farm ... | ... | .07 | .08 | 1.67 |
| Inyanga— | | | | |
| St. Trias' Hill ... | ... | 1.38 | 1.78 | 2.16 |
| Insiza— | | | | |
| Roodeheuvel ... | .21 | .50 | .71 | 1.49 |
| Stoneham (Brac Valley) ... | ... | .32 | .56 | n.s. |
| Makoni— | | | | |
| Bude ... | ... | 1.24 | 1.32 | n.s. |
| Chirumwe ... | ... | ... | ... | n.s. |
| Craigendoran ... | ... | 1.62 | 2.50 | 1.65 |
| Forest Hill ... | ... | .34 | .73 | 1.74 |
| Gorubi Springs ... | ... | ... | ... | 1.77 |
| Inyagura ... | ... | ... | .18 | n.s. |
| Kairidzi ... | ... | .58 | .65 | n.s. |
| Mona ... | ... | 1.39 | 1.47 | 1.97 |
| Monte Cassino ... | ... | 2.30 | 3.32 | 1.94 |
| Ruati ... | .29 | .14 | .60 | n.s. |
| Rusape (N.C.) ... | ... | 2.08 | 2.22 | 1.70 |
| Springs ... | ... | 1.77 | 2.14 | 1.75 |
| Whitgift ... | ... | 2.22 | 2.34 | n.s. |

## RAINFALL—(*Continued*).

| STATION. | 1929. Sept. | 1929. Oct. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| ZONE E.—(Continued) | | | | |
| Marandellas— | | | | |
| Bonongwe ... | ... | 2.19 | 2.49 | 1.81 |
| Delta ... | ... | .57 | .79 | 1.79 |
| Elandslaagte ... | ... | .74 | 1.04 | 1.77 |
| Lushington ... | ... | ... | .21 | n.s. |
| Macheke ... | ... | ... | .13 | 1.97 |
| Marandellas (N.C.) ... | ... | 1.91 | 2.22 | 2.05 |
| Marandellas Estate ... | ... | ... | ... | 1.81 |
| Nelson ... | ... | ... | ... | 1.59 |
| Wedza Reserve ... | ... | .10 | .10 | n.s. |
| Wenimbi ... | ... | 1.43 | 2.68 | 1.79 |
| Melsetter— | | | | |
| Brackenbury ... | ... | ... | ... | 2.90 |
| New Year's Gift ... | .06 | .97 | 1.09 | n.s. |
| Sabi Tanganda Estate ... | ... | .34 | .34 | n.s. |
| Ndanga— | | | | |
| Bangala Ranch ... | ... | .59 | 1.00 | ... |
| Doornfontein ... | ... | .94 | 1.39 | 1.47 |
| Marah Ranch ... | ... | ... | ... | 1.75 |
| Triangle Ranch ... | ... | ... | .30 | 1.31 |
| Zaka ... | ... | .46 | .79 | 2.16 |
| Selukwe— | | | | |
| Aberfoyle Ranch ... | ... | .95 | 1.02 | 1.75 |
| Hillingdon ... | ... | .78 | .85 | 1.77 |
| Impali Source ... | ... | .64 | .64 | 1.69 |
| Rio ... | ... | .53 | .53 | 1.65 |
| Safago ... | ... | .22 | .44 | 1.82 |
| Selukwe ... | ... | ... | .20 | 2.24 |
| Umtali— | | | | |
| Argyle ... | ... | 2.43 | 2.52 | 1.75 |
| Embeza ... | ... | 1.16 | 1.16 | n.s. |
| Fairview ... | ... | .62 | 1.06 | 1.77 |
| Fern Valley ... | ... | 1.23 | 1.63 | 1.99 |
| Jerain ... | ... | .20 | .20 | 1.79 |
| Mutambara Mission ... | ... | ... | ... | 1.65 |
| Odzani Power Station ... | ... | .45 | .99 | 2.03 |
| Park Farm ... | ... | .94 | 1.53 | 2.39 |
| Premier Estate ... | ... | 1.92 | 2.16 | 1.71 |
| Sarum ... | ... | .52 | .65 | 1.59 |
| Sheba ... | ... | 1.17 | 3.90 | n.s. |
| Stapleford ... | ... | 1.02 | 2.17 | 3.98 |
| St. Augustine's Mission ... | ... | .76 | 1.39 | 3.33 |
| Transsau Estate ... | ... | 2.60 | 2.60 | 1.69 |
| Umtali Gaol ... | ... | .72 | 1.28 | 1.83 |
| Victoria— | | | | |
| Bruceshame ... | ... | .17 | .17 | 1.55 |
| Cambria ... | ... | .08 | .29 | 1.49 |
| Cheveden ... | ... | 1.23 | 1.77 | 2.11 |
| Clipsham ... | ... | .16 | .36 | 1.59 |

## RAINFALL—(*Continued*).

| Station. | 1929. Sept. | 1929. Oct. | Total to end of period. | Normal rainfall to end of period. |
|---|---|---|---|---|
| **Zone E.—(Continued)** | | | | |
| Victoria (Continued)— | | | | |
| Gokomere ... | ... | .75 | .98 | 1.61 |
| Kimberley Ranch ... | ... | 1.11 | 1.11 | n.s. |
| Mashaba ... | ... | .34 | .47 | 2.09 |
| Miltonia ... | ... | .11 | .11 | n.s. |
| Riverdene North ... | ... | .48 | .69 | 1.64 |
| Salemore ... | ... | ... | .17 | 1.81 |
| Silver Oaks ... | ... | .28 | .48 | 1.59 |
| Stanmore ... | ... | ... | ... | 1.48 |
| Victoria ... | ... | .22 | .41 | 1.47 |
| Zimbabwe ... | ... | .34 | .72 | 1.97 |
| **Zone F.:** | | | | |
| Melsetter— | | | | |
| Chikore ... | ... | 2.29 | 3.28 | 3.21 |
| Chipinga ... | ... | 2.33 | 2.33 | 3.32 |
| Lettie Swan ... | ... | ... | .94 | n.s. |
| Melsetter ... | ... | .89 | 2.50 | 3.51 |
| Mount Selinda ... | .08 | 1.37 | 2.56 | 4.66 |
| Vermont ... | .12 | 2.68 | 3.76 | 3.72 |
| Umtali— | | | | |
| Cloudlands ... | .03 | 2.08 | 3.31 | n.s. |

## Dates of Meetings of Farmers' Associations, Southern Rhodesia.

| Name of Association. | Place of Meeting. | Secretary. | Dec. | Jan. |
|---|---|---|---|---|
| | | | 1929 | 1930 |
| Ayrshire—Sipolilo | Various farms | G. H. Cautherley | 14 | 11 |
| Banket Junction | Banket Hotel | A. M. Hutchinson | 6 | 3 |
| Beatrice District | Farmers' Hall, Beatrice | W. Krienke | 26 | 30 |
| Bindura | Bindura Farmers' Hall | W. E. Fricker | 13 | 10 |
| Bromley | Farmers' Hall, Bromley Siding | E. Taylor | 4 | 1 |
| Bubi | Queen's Mine | W. H. Perham | 20 | 17 |
| Bulawayo Landowners' and Farmers' Association | Library Buildings, Bulawayo | T. B. Hepburn | 12 | 9 |
| Chakari | Various farms | Lady Codrington | 18 | 15 |
| Daisyfield | Daisyfield (Dec.), Somabula (Jan.) | L. E. Edwards | 21 | 11 |
| Darwendale—Trelawney | Various farms | Charles H. Tanner | 25 | 22 |
| Eastern Districts | Farmers' Hall, Chidza | W. E. Richards | 14 | 11 |
| Enkeldoorn | Enkeldoorn | C. N. Ludlowe | 3 | 7 |
| Enterprise | Farmers' Hall | W. Stobart | 3 | 7 |
| Essexvale | Essexvale | Col. D. Judson | 15 | 19 |
| Felixburg—Gutu | Felixburg (Dec.), Wheatlands (Jan.) | E. C. Fleetwood | 14 | 11 |
| Figtree Branch, R.L. and F.A. | Figtree Hotel | The Secretary | 3 | 7 |
| Gadzema | Gadzema Hotel | H. G. M. Liddell | 13 | 10 |
| Gatooma | Speck's Hotel | Col. J. A. Smith | 21 | 18 |
| Gatooma (Golden Valley Branch) | Golden Valley Hotel | C. K. James | 14 | 11 |
| Gazaland (South Melsetter) | Farmers' Hall, Chipinga | J. Ward | 21 | 18 |
| Greystone | Quarrie Farm | P. J. van der Walt | ... | 11 |
| Gwanda | Lowenthal's Building, Gwanda | N. J. B. Nilson | 21 | 18 |
| Hartley | Hartley Hotel | Mrs. F. C. Watson | 14 | 11 |
| Headlands | Headlands | J. A. Eve | ... | ... |
| Hunter's Road | Hunter's Road | R. W. Twilley | 28 | 25 |
| Insiza South | Farm Lancaster | J. Campbell | ... | 9 |
| Inyazura | Inyazura | W. P. Frudd | 6 | ... |
| Lalapansi | Lalapansi | B. J. Ingle | 14 | 11 |
| Lomagundi | Sinoia | F. W. Robertson | ... | ... |
| Lomagundi West | Various farms | A. A. Bisset | 8 | 12 |
| Macheke | Farmers' Hall, Macheke | R. O. Jackson | ... | ... |

| | | | | |
|---|---|---|---|---|
| Macheke Valley (Headlands) Farmers' and Tobacco Growers' Association | Various Farms | T. R. Colam | 7 | 4 |
| Makwiro | Makwiro | W. L. Parsons | 20 | 17 |
| Marandellas | Marandellas Farmers' Hall | E. Cruikshank | 6 | 3 |
| Marandellas, Southern | Various farms | B. V. Cherry | 4 | 1 |
| Mashonaland | Mashonaland Farmers' Hall, Salisbury | C. Lamb | 13 | 10 |
| Matobo South | Farmers' Hall, Malundi Farm | A. G. Allan | 21 | 18 |
| Matopo Branch, R.L. and F.A. | Farmers' Hall, Malundi | W. Mirtle | 21 | 18 |
| Mazoe (Concession) | Various farms | Douglas Southey | 13 | 10 |
| Mazoe (Glendale) | Farmers' Hall, Glendale | James S. Brown | 11 | 8 |
| Melsetter | Court House, Melsetter | J. C. Kruger | 12 | 9 |
| Midlands Farmers and Stockowners | Royal Hotel, Gwelo | T. R. van Rooyen | 11 | 8 |
| Ngezi-Umniati | Harvieston, Enkeldoorn | Miss Harvie | 28 | 25 |
| North Umniati | —— | J. F. Eagar | Not | received |
| Norton and Lydiate District | Norton | R. D. Palmer | 6 | 3 |
| Nyamandhlovu | Nyamandhlovu | R. D. McLean | ... | ... |
| Odzi District Farmers | Odzi Hotel | M. Goldberg | 7 | 4 |
| Poorte Valley | Various places | A. D. Wilson | 21 | 18 |
| Que Que | Offices of the Que Que Sanitary Board | A. A. Ackerman | 21 | 18 |
| Rusape Farmers' Association | Rusape | R. Munch | 7 | 4 |
| Salisbury South | Various farms | P. Linton | 25 | 29 |
| Selukwe | The Hotel, Selukwe | W. T. Simpson | ... | ... |
| Shamva | Shamva Court House | W. Stanley-Stollard | 20 | 17 |
| Two Rivers Farming Association | Various farms | W. L. Parsons | 21 | 18 |
| Umboe (Branch of Lomagundi F.A.) | Various farms | C. W. S. Ford | 14 | 11 |
| Umvukwe Farmers' and Tobacco Growers' Association | Various ranches | Com. E. Wrightson | 14 | 11 |
| Umtali | Drill Hall, Umtali | A. Howat | 5 | 2 |
| Umvuma and District | Umvuma | S. T. Montgomery | Not | received |
| Victoria | Victoria | G. E. Lamb | 7 | 4 |
| Wankie District | —— | F. H. Going | Not | received |
| West Umvukwe Farmers' Association | Various farms | G. H. Gordon | 7 | 4 |
| Western | Plumtree Hotel | The Secretary | 14 | 11 |
| Willoughbys | Willoughbys | A. E. Roberts | Not | received |

# Export of Cattle from Southern Rhodesia, 1929.

| Month | Union | | England. | Congo | | N. Rhodesia | Portuguese East Africa. | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Slaughter | | Slaughter | | | | | | | |
| | Johannesburg | I.C.S. for overseas | On hoof | Slaughter | Breeding | Breeding | Slaughter | Trek | Breeding | |
| January ... | 66 | ... | ... | 2,222 | 272 | 12 | ... | ... | ... | 2,572 |
| February ... | 84 | ... | ... | 656 | ... | ... | 12 | ... | ... | 752 |
| March ... | 12 | 1,353 | ... | 1,845 | 1,803 | 19 | 24 | ... | ... | 5,056 |
| April ... | 242 | 1,842 | 75 | 2,933 | 1,131 | ... | 38 | ... | 22 | 6,283 |
| May ... | 224 | 4,318 | 620 | 1,508 | 2,966 | 17 | 24 | ... | ... | 9,677 |
| June ... | 538 | 6,322 | ... | 2,989 | 936 | 34 | 48 | ... | ... | 10,867 |
| July ... | 799 | 6,417 | ... | 1,417 | 85 | 14 | ... | ... | ... | 8,732 |
| August ... | 1,358 | 6,457 | ... | 2,530 | 684 | 21 | ... | ... | ... | 11,050 |
| September ... | 1,699 | 4,406 | ... | 884 | 7 | 185 | ... | ... | ... | 7,179 |
| October ... | 1,527 | 1,936 | ... | 2,941 | 6 | ... | ... | ... | 12 | 6,722 |
| November ... | | | | | | | | | | |
| December ... | | | | | | | | | | |

# Farming Calendar.

## December.

### BEE-KEEPING.

With a normal season the first or main honey-flow of the year should now be over and the honey ready to be robbed. Before doing this, see that all or the main portion of the frames are capped and sealed, otherwise there will be trouble later on by fermentation. There is nothing on the market to equal the Porter bee-escape board to clear out the bees from the crate, but be sure and see that the board in question is placed the right side up under the crate; failure to do this (and in the hurry of the minute it can easily be so done) will result in the probable suffocation of the bees and the loss of the honey, to say nothing of the chances of robbing from any close-by hives. Replace the empty combs and frames as soon as possible on the hives, to be cleaned up and mended where necessary, and for future storage of more honey. During the very hot spells watch the hives and provide extra ventilation, by inserting small metal wedges between the crates, just wide enough to allow air in, but not a bee under any consideration. Keep all water tins under the hive-stand legs full of water, and see that water is available for the worker bee, which drinks a good deal. When extracting honey, do so in a bee-tight room or verandah, otherwise the operator may have a lot of trouble from other colonies, which quickly find where honey is. Always have one or more crates of shallow frames ready with foundation fixed to place on hives as the season may warrant; such will mean always something for the bees to work at, and during the last flow they may be invaluable to store any such catch crop of nectar, as from tobacco, etc., when the natural flora is finished.

### CITRUS FRUITS.

This is a good month to plant citrus trees into their permanent positions. They should on no account be planted deeper than they stood in the nursery. Water each tree immediately after planting it to settle the soil, then loosen the surface when sufficiently dry to check weed growth and restrict evaporation; continue loosening the surface soil after each rain or watering.

If good rains have fallen, disc the grove in two directions, then sow the cover crop and harrow also in two directions. If the grove is weedy it should receive a shallow ploughing in place of the discing. Then sow the seed and harrow the soil.

All bearing trees must be kept well watered if the weather continues to remain dry. Trees that suffer for want of moisture while the young fruit crop is developing will be adversely affected, and the crop—if any—will be of inferior quality.

Continue to rub off all water shoots or suckers which develop on the tree stems.

### CROPS.

Keep the cultivators going, both on planted and unplanted lands, whenever weather conditions are favourable. Destroy the weeds while young and before they obtain a firm root-hold.

Continue planting maize, cotton, beans and ground-nuts as early as possible this month, followed by sunflowers, Sudan grass, manna, pumpkins and cattle melons.

Linseed, cowpeas, teff grass, oats, sunn hemp, should be planted after the other crops are in.

Ensilage crops may be sown at the end of the month.

When harrowing maize after planting, this work should be done in the heat of the day when the young plants are flaccid and not easily broken.

On lands not yet planted the crop of weeds should be kept down by disc-harrowing.

It is a good plan to harrow or disc-harrow immediately before the planter, or alternatively to follow the planter with a light harrow.

Treat seed oats for smut before sowing. Use one pint of formalin to 25 gallons of water and steep the bag of seed for ten minutes.

Earth up early planted potatoes.

Keep a look out for the stalk-borer and top or otherwise treat affected plants.

New lands and old pastures may be broken, as circumstances permit, during December, January and early February, and again ploughed in from May to July. If they carry a heavy crop of grass it should be cut or burnt to enable good clean ploughing to be done.

Sweet potato slips should be planted early in this month. Do not fail to have in a few acres of this valuable crop.

## DAIRYING.

During the months of December and January veld grazing is usually plentiful, and very little extra feed in the form of concentrates is required for dairy stock. It should be borne in mind, however, that heavy milking cows are unable to satisfy their requirements for milk production from veld grazing alone, and should receive a daily allowance of grain; the latter should be fed at the rate of 2 lbs. for every gallon of milk produced daily, i.e., a cow producing three gallons of milk should receive 6 to 7 lbs. of concentrates. An excellent mixture for this purpose is one consisting of four parts maize meal and one part ground-nut cake.

During wet weather, the provision of a clean dry shelter for calves is essential; the latter should not be crowded together in a small, damp, badly ventilated pen or muddy kraal. When treated in this manner, a calf is very liable to contract various ailments such as scour, etc. Scour is entirely preventable, and is usually caused by over feeding, or feeding from dirty pails, feed boxes, etc. Calves which contract scour should be isolated, the milk ration reduced, and they should be dosed with a few tablespoonfuls of castor oil.

Under the weather conditions which now obtain, cream should be despatched to the creamery at least three times a week. It is of the greatest importance that cream should be cooled immediately after separation, and should be kept cool while on the farm and whilst in transit to the railway station or siding. While the cream is being cooled, it should be frequently stirred, using a stirrer with a plunger attachment. Warm, freshly separated cream should not be mixed with old cream which has already been cooled. Cool the fresh cream first and then mix thoroughly with the old cream. Gassiness is a common defect in the cream received at the creameries at this time of the year, and is caused by gas-producing organisms with which the milk and cream are contaminated. These organisms abound in mud, manure, etc., and develop and multiply very rapidly at high temperatures. Any precautions therefore which may be taken to eliminate dirt, manure, etc., from the milk and to keep the cream cool will prevent the development of gassiness.

As the night temperatures are fairly high, cheese-makers should not attempt to use night's milk for cheese-making; morning's milk plus a starter will give the best results. Gouda cheese-making operations are not usually successful at this season of the year, owing to the poor quality of the milk and the prevalence of gassiness. This type of cheese is best manufactured during March and subsequent months.

## DECIDUOUS FRUITS.

Cover crops may be planted when the rains commence, as recommended under citrus fruits.

Summer pruning may be commenced this month. If all undesirable shoots are taken out of the trees, the remaining shoots will receive sufficient air and light to mature.

Ripening fruit must be carefully harvested, graded and packed if satisfactory prices are to be secured. Do not gather any fruit when it is wet.

Keep all recently planted trees in good condition; the first year's growth is the most important. If the undesired shoots are rubbed off when they first appear, the retained shoots will receive all the nourishment and the tree will then grow to a large size.

## ENTOMOLOGICAL.

Maize.—The first half of this month appears to be the best period during which to plant maize for the avoidance of stalk borer attack—at least in the Salisbury district. Hoe out and remove volunteer maize plants before the new crop is up, as they are liable to be infested with borer, which tends to spread to surrounding plants. Red soils may be baited with chopped Napier fodder or other suitable greenstuff dipped in arsenite of soda 1 lb., cheapest sugar 8 lbs. or molasses 1 gallon, water 10 gallons, to destroy surface beetles, snout beetles and other insects which may affect the primary stand.

Tobacco.—The enemies of this crop are in general most active during December, whilst the crop is still in the early stages of growth.

For information regarding tobacco pests, see "Rhodesia Agricultural Journal," January, 1928, or Bulletin No. 665.

In general, poisoned baits may be used against surface beetles, grasshoppers, crickets and cutworms. Against surface beetles, arsenite of soda 1 lb. in 30 gallons of water used to moisten maize bran is a good bait. Against grasshoppers and crickets the addition of 8 lbs. sugar or 1 gallon molasses to each 1 lb. of arsenite of soda is recommended. Spray with arsenate of lead (powder) 1 lb. in 30 gallons of water against leaf-eating insects and as a protection against leaf miners and stem borer. Transplants may be dipped head downwards as far as the roots in the poison. Discard seedlings infested with stem borer and root gallworm.

Cutworms.—Keep ground around seed beds as free as possible from vegetation, to prevent female moths from laying eggs there. From the time the plants show foliage of the size of a sixpence they should be sprayed weekly with arsenate of lead (powder) 1 lb. to 30 gallons of water. This should prevent cutworms developing in the beds, as the young cutworms attack the leaves of the seedlings, and so ingest the poison.

House Flies.—With the coming of hot weather and the rains, house flies greatly increase, and should be kept out of dwelling houses by mosquito netting, or poisoned in the following way:—Dissolve 1 lb. of sodium arsenite in 10 gallons of water, and add about 10 lbs. of cheap sugar (2 gallons of treacle) or other sweet substance. The mixture should be sprayed upon branches of shrubs or trees, which may be hung up in convenient places where flies congregate. These insects are attracted to the bait, and are easily poisoned.

Mosquitoes, Stable Flies.—Destroy breeding places around homestead. Poison or trap adults.

Potatoes.—Ladybirds and caterpillars may be injurious to the foliage, and on sandy soils blue blister beetles sometimes cause damage. Spray with arsenate of lead (powder) 1 lb. to 25 gallons of water.

Kitchen Garden.—Marrows, etc., are commonly attacked by leaf-eating beetles. Spray with arsenate of lead (powder) 1 lb. in 25 gallons water, plus 8 lbs. cheapest sugar or 1 gallon molasses. Dusting lightly with pure arsenate of lead powder should give protection. Young plants of the cabbage family may be dusted with pure arsenate of lead powder or with such powder mixed with up to six or eight parts of finely sifted, thoroughly slaked lime as a protection against leaf-eating insects.

Fruit Trees.—The regular collection and destruction of fruit beetles may be necessary. Choice varieties of peaches, etc., may be netted as a protection against pests.

## FLOWER GARDEN.

This month is generally showery, and constant stirring of the soil is, therefore, necessary to keep it loose. Seeds of perennials and annuals for February blooms may be sown. Transplanting should be done in the evening or on a cloudy day. Carnations should be kept free from dead wood, and climbers attended to.

## VEGETABLE GARDEN.

All vegetable seeds may be planted. All advanced plants should be constantly cultivated. Potatoes should be ridged, and peas, beans and tomatoes staked. This is a good month for planting the main crop of potatoes.

## FORESTRY.

Final preparations for planting should be made, including harrowing or pitting. Early plantings may be carried out if the season is a good one. Planting should be carried out on dull, rainy days, or failing such days, late in the afternoons. Great care should be exercised in planting out to avoid bending the tap root, and to set the trees in the ground at the same level as they were in the seed bed or tray. Late sowings of Cedrela toona seed may be made.

## POULTRY.

The poultry keeper should take precautions whereby the wet weather will not affect his birds' health and their laying powers. All houses must be absolutely watertight, the floor raised well above the level of the surrounding ground, thus preventing water seeping in and making it damp. The birds themselves should not get wet, and no pools of water should be seen in the runs. Foodstuffs also must be kept absolutely dry.

Many birds will at present be moulting; these require special treatment to bring them through it quickly, and if possible keep them in lay during the period. A pamphlet on this can be obtained from the Poultry Expert, Department of Agriculture. This lack of attention to the birds during the moult is one of the causes of the scarcity of eggs at this season. There is no need for it if poultry keepers would only look after their birds properly.

Those who intend disposing of their turkeys for killing at Christmas must avoid cooping them up, as is done when fattening fowls, for they immediately mope and go off their food. Give them free range, and in addition to their usual evening feed of maize, during the first week of December give one of wheat or maize in the morning, and during the second and third weeks three meals a day, each one containing, in addition to wheat or maize, some crushed monkey nuts or sunflower seeds. Plenty of thick milk and chopped-up onions or onion tops should also be given.

Those who go in for ducks should feed well and get as many to marketable size as possible by Christmas, when they usually fetch good prices. They should be kept in a small run; nearly all their food should be wet mash, bran, pollard, maize meal, meat meal and milk, as much as they will eat three times a day, i.e., they should practically be allowed to spend their existence eating and sleeping. Big duck breeders often give a fourth meal by lamplight at 10 p.m., and the first meal is given at sunrise.

## STOCK.

Cattle.—Ranching cattle should not require any attention beyond dipping, but any stock that are in weak condition will be the better for a little hay or a pound or two of maize at night until they have regained strength. The bulls should be returned to the herd either at the end of the month or in January, and it should be remembered that the better they are conditioned and fitted for their work the more hope there is of a good crop of calves. For this reason also every effort should be made to have all the female stock in strong condition. Dairymen will find that as the grass becomes lush and rank a supply of sweet veld hay, teff hay or, say, three pounds of crushed maize given in the sheds at night will enhance both the quality and quantity of the milk. This will be found to be the case more particularly in districts of heavy rainfall. Milch cows should be protected as much as possible from cold rains and hot sun. Yarding all night in a clean kraal provided with a simple lean-to shed well bedded up will be found to be very beneficial in seasons of protracted rainfall. The calf pen should be kept clean, dry and sweet, and young calves will be better kept in during very hot or very wet weather. Dipping should be regularly attended to.

Sheep.—Graze on the higher lands, keeping the kraals clean, dry and airy, and watch for ticks.

## TOBACCO.

Continue preparation of land. The best results are obtained by transplanting on freshly prepared soil. Transplanting should be pushed on with as fast as transplants and climatic conditions will allow. As soon as plants begin to grow, go over the field and fill in all missing hills with strong selected plants, and then apply fertiliser to hasten growth and ensure early maturity. Cultivation should be commenced as soon as the plants start growing, especially on sandy soils. The crust caused by heavy rains should be pulverised through cultivation as soon as the surface soil is dry enough for tillage; this gives the young plants the benefit of the moisture stored in the soil. Do not neglect the late sown seed beds. Make every effort to finish transplanting before the end of the month, so that the crop will be harvested before dry, cool weather begins.

## VETERINARY.

Occasional cases of horse-sickness may occur during this month. With the great increase in ticks, due to the heat and moisture, cases of redwater and gall-sickness may be expected, more especially amongst Colonial stock imported since the last rainy season. The cool weather which frequently follows the early rains is an excellent time for castrating calves and other animals.

## WEATHER.

In Mashonaland the rainfall during this month varies from eight inches along the eastern border to six inches in the west. In Matabeleland it varies from five-and-a-half inches in the west to four-and-a-half inches in the south. Considerable divergencies from these normals may occur in individual seasons, but on the whole this month is the most regular in its behaviour. Very heavy downpours may be looked for, and it is well

to be provided by drains and ditches against the effects of very heavy rain storms. A dry spell about Christmas time is a very frequent, though not invariable, event in Rhodesia. This partial drought may last only a fortnight, or may extend to six weeks, in the latter event often causing some anxiety regarding young crops, especially those not yet through the ground. The best means of meeting this condition of the weather is by frequent surface cultivation by harrow or horse hoe to preserve a loose soil mulch on the surface and prevent losses of soil moisture by evaporation.

# January.

## BEE-KEEPING.

This month is a slack one for actual hive work. Each hive should continue to be carefully watched to see that any attempt by the wax moth to gain a footing is at once stopped. In the great heat of this month, see that proper ventilation is supplied, as well as enough water. Precautions against the depredations of white and other ants should also be watched daily. Where possible, examine now and again the brood chamber for queen cells, and destroy them if not wanted. Requeening can be done where desired on the uniting system, if the apiarist does not know of the better plan of rearing his own queens. In the workshop have a spare hive or two complete and ready for occupation, well painted, for any new swarms that may be required in the coming months. Though the second honey flow of the season is not due to start until about March or April, there should be ample stores coming in meanwhile to keep all bees busy in breeding, nursing, and bringing the hive generally to full strength for the winter, as well as for their own daily food supplies. There will not be enough honey coming in now for surplus purposes, therefore see that the supers are not left on the hives to a greater degree than to give the inmates plenty of room to loaf in.

## CITRUS FRUITS.

The planting of citrus trees should be completed if possible by the end of the month, for trees planted later may not harden up before the winter; they then become susceptible to winter injury from cold. This month is the best one for planting shelter belts to protect all varieties of fruit trees from the prevailing dry winds. Cover or green crops may be planted during this month; if the grove has been over-run with grass or weeds, sow the cover crop seed more thickly. This will assist in smothering future weed growth. Continue suppressing any undesirable shoots that may develop on the tree trunk or other parts of the tree. Drain any depressions that allow rain or irrigation water to accumulate at the base of the trees, for trees permitted to stand in water will speedily fall victims to disease or pest injury.

## DECIDUOUS FRUITS.

Continue planting cover or green crops between the trees. These crops may then be turned under towards the end of the rainy season to furnish the necessary humus.

Summer pruning may be continued. Rub or break out any undesirable shoots that have a tendency to crowd each other; suppress all growths on the main stem from the ground level up to the main arms of the tree, for these are unnecessary. If next year's fruit crop is to be of good size and quality, the inner fruiting wood of a tree must receive sufficient air and light to mature fully. If the new growth is too dense

it will prevent the fruiting wood from maturing, and poor crops will be the result. The thinning out of the summer growth will overcome this crowding and weakening of the fruiting wood.

Many fruits will be ripening during the month. Do not permit the fruit to become over-ripe on the trees; rather harvest it at the correct stage and store or sell the surplus.

Plant shelter trees if the orchard is exposed to the prevailing winds, as good crops of fruit cannot be expected from inadequately protected fruit trees.

## CROPS.

If not already sown, put in the ensilage and fodder crops at once, such as maize and legumes, oats and other hay grass crops. Sow short season crops like haricot beans, linseed, buckwheat, peas, summer oats, gram and mung bean. Plant out grasses and kudzu vine for pasture. Ridge potatoes and cultivate thoroughly. Main crop can still be planted. Quick growing green manuring crops, such as cowpeas, soya beans and sunn hemp, may still be sown this month. Earth up ground nuts so that a small amount of loose soil is thrown over the crowns of the plants. This assists the formation of nuts. If not already done and where practised, legumes or long season oats such as Algerian can be sown under the maize crop for grazing and to add nitrogen and humus to the soil. Cultivate all growing crops well, and thoroughly eradicate weeds. Overhaul all hay-making implements and ploughs and get in thorough repair in preparation for the haying and ploughing seasons. Endeavour to mow grass fields early for hay and litter, and to obtain second cutting for hay in April. Fallowed lands or fields not yet planted may be disc-harrowed or ploughed to prevent weeds from seeding. Mow grass paddocks infested with annual weeds to prevent the weeds seeding. Prevent Mexican marigold and other noxious weeds seeding by hoeing or pulling out the plants by hand. Keep a sharp look-out for maize stalk borer. Cut off the tops of infested plants or treat them with a recognised chemical preparation. If topping is practised, remove tops from land, and bury, burn or feed them at once to farm stock. Watch the maize lands for witch weed. Prevent witch weed plants from seeding by cultivation and by hand-pulling the plants. Make as much manure as possible by placing grass and litter in cattle kraals, pig sties and stables. If there is stumping and clearing to be done, push on with it. Endeavour to get as much of the new virgin land as possible broken up during this and the two following months.

## DAIRYING.

(See December.)

## ENTOMOLOGICAL.

Maize.—Late planted crops are subject to attack by snout beetles, grasshoppers and crickets. Poisoned bait is a useful remedy. Write for particulars. Plants infested with stalk borer may be cut out, removed from the land and destroyed. Crops planted after the new year are frequently attacked very heavily by stalk borers of the second brood (February to March) and are commonly of little value, except for ensilage. If the lands are allowed to become weedy, especially with grasses, during this month, loss may occur from leaf-eating caterpillars when the lands are cultivated. Danger from the army worm is also greater in weedy than in clean lands.

Tobacco.—Most pests of this crop may be active during January, e.g., wireworms, surface beetles, crickets, grasshoppers, stem borer, leaf miner, etc. Consult article on tobacco pests in "Rhodesia Agricultural Journal," January, 1928.

Potato.—This crop may be sprayed with arsenate of lead (powder) 1 lb. in 25 gallons of water if attacked by leaf-eating ladybirds, blister

beetles or other leaf-eating insects. This poison may be combined with Bordeaux mixture when spraying against early blight.

Kitchen Garden.—Marrow and cucumber plants about to set fruit may be sprinkled regularly with the following formula to destroy fruit flies which "sting" fruit:—Arsenate of lead (powder) $1\frac{1}{2}$ ozs., molasses $\frac{1}{2}$ gallon or cheapest sugar $2\frac{1}{2}$ lbs., water 4 gallons. To destroy leaf-eating insects generally dust plants with arsenate of lead (powder) 1 part in 20 parts of finely ground maize meal or finely sifted slaked lime. Aphides (plant lice) may be treated with soap 1 lb. in 5 gallons of water, or tobacco wash, or simply by regular spraying with a forceful stream of cold water from a spray pump.

Fruit Trees.—Deciduous fruits are subject to attack by large beetles, which should be destroyed by jarring into a net and dropping thence into a tin containing water with a film of paraffin oil on the surface. Trees should be covered in mosquito netting to protect the fruit from fruit-piercing moths. The large adult beetles of the fig borer may be seen on the young shoots and should be destroyed. Borers in the trunks of the trees may be killed by injecting a little carbon bisulphide.

Mosquitoes, House Flies, etc.—Screen windows and doors. Destroy breeding places around homestead. House flies may be poisoned cheaply with sweetened arsenite of soda solution. Write for directions.

**When in doubt as to the identity of any pest or the method of dealing with it, apply promptly to the Chief Entomologist, Salisbury, bringing or sending specimens of the insects concerned. Note, however. that it is sometimes feasible to prevent injury from pests for which no practical remedy is known. Farmers should therefore endeavour to obtain some knowledge of the pests of the crops they are growing through the articles published in this Journal.**

## FLOWER GARDEN.

This month requires all one's energy in the flower garden. Annuals may still be sown for late flowering before the season is over. Planting out should be done as early as the weather permits, and advantage taken of a dull day after a shower for this work. If care be exercised much smaller plants may be put out than would at first be thought advisable, as with attention these will make stronger plants than larger ones, which are more likely to receive a check. The soil requires constant stirring, owing to the packing caused by the rains and for the eradication of weeds, which are now very troublesome. All plants should be kept free of dead and decaying matter.

## VEGETABLE GARDEN.

Turnips, carrots, cabbages, lettuce, etc., may be sown for carrying on during the winter months. Potatoes may be planted this month for keeping through the winter. Weeding and cultivating between the rows should be continually carried on.

## FORESTRY.

If the rains are seasonable, plant out evergreen trees, such as gums, cypress, pines, etc. Fill in all blanks as soon as they are noticed, and do not leave them until the following season. Planting should be done on a wet day, or, failing that, on a dull day, or late in the afternoon. Great care should be taken to see that the trees are not planted out any deeper than they stood in the tins.

## POULTRY.

The continuance of the long spell of hot, dry weather has been finding out the weak spots in the constitution of many birds. Naturally those that are strong and vigorous come through it well and do their duty; the weaker ones stop laying. To a large extent, however, the remedy is in the hands of the poultry breeder. If he treats the birds properly, *i.e.*, makes them take plenty of scratching exercise, lessens the amount of heating and fattening food given and increases the amount of cooling

foods, *e.g.*, green food, thick milk, etc., his birds will come through the hot, dry weather well, and also lay well. However, the hot, dry period should nearly be at an end now, and the poultry keeper has to take precautions whereby the wet weather will not affect his birds' health and their laying powers. All houses must be absolutely watertight, the floor raised well above the level of the surrounding ground, thus preventing water seeping in and making it damp. The birds themselves should not get wet, and no pools of water should be seen in the runs.

Foodstuffs must be kept absolutely dry, otherwise they will become mouldy and sour, causing disturbance of the intestinal tract, illness, and perhaps death; certainly a diminution in the number of eggs.

Some of the birds will now be in moult. To get them through it quickly give more sunflower seed, some monkey nuts, plenty of green food, especially cabbage, kale, etc., plenty of milk or some meat, a little sulphur in the dry mash (one teaspoonful to 1 lb.); also stew two dessert spoonfuls of linseed in a pint of water to a jelly, mix this to a crumbly consistency with mealie meal or bran, and give about one dessert spoonful to each bird daily. Keep the birds dry during the rains, otherwise the egg output will decrease.

Do not hatch any more turkeys till after the rainy season is over. Any birds other than turkeys destined for the Christmas markets should be penned up in crates for a fortnight before killing and fed well. Turkeys should not be penned up, but allowed on free range; those for the Christmas market should be given more food.

Those who go in for ducks should feed well and get as many to marketable size as possible by Christmas, when they usually fetch good prices. They must be treated in almost exactly the reverse manner to what turkeys are. They should be kept in a small run; nearly all their food should be wet mash, bran, pollard, mealie meal, meat meal and milk, as much as they will eat three times a day, *i.e.*, they should practically be allowed to spend their existence eating and sleeping. Big duck breeders often give a fourth meal by lamplight at 10 p.m., and the first meal is given at sunrise.

## STOCK.

Cattle.—The recommendations for December apply equally to this month. Bulls should be returned to the herd during the month if a September or October calving season is desired.

Sheep.—Continue as recommended for December. If heavy rains are experienced a daily ration of a quarter of a pound of maize per ewe will keep them in condition, and will often prevent much trouble arising from poverty and anæmia. Those who favour autumn lambs must put the ram again with the flock in February, and should therefore now take steps (if necessary) by supplying a little extra feed as above recommended to fit the ewes for mating. A little forethought of this kind will tend to increase the stamina of the lambs and to bring the ewes in season more or less together, so that a protracted lambing season is avoided.

## TOBACCO.

Cultivation should be systematically continued, and no foreign vegetation allowed in the tobacco field, as weeds and grass induce insect attacks. All backward plants should be given special attention, and an additional application of fertiliser to hasten growth, so that the plants ripen as uniformly as possible. Curing barns should be placed in proper condition on rainy days, and all tobacco appliances should be placed in proper order for the rush of work during the curing season. Early planted tobacco may be ready for topping during the latter part of the month, and the common mistake of topping too high should be avoided. Go over the field carefully and select typical, uniform and disease-free plants for producing seed for next season's crop. All plants should be properly primed at the same time that the tobacco is topped.

## VETERINARY.

Horse sickness may now be expected, especially in districts where early heavy rains have occurred. Blue tongue in sheep will also be prevalent.

## WEATHER.

Heavy rain is to be looked for, and during this month we may normally expect nine to twelve inches on the eastern border, eight in the north, and seven to seven and a half as one travels westwards or southwards. At this time of the year the rainfall tends to be heavier in the eastern than in the western portions of the Colony, whilst prolonged steady rains take the place of the thunder showers which marked the earlier part of the wet season. The growing period is at its height, and high temperatures are registered.

# Notes from the "Gazette."

| "*Gazette*" *Date.* | *Items.* |
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| | GAME LAW. |
| 8.11.29. | Government Notice No. 675 suspends, until further notice, the provisions of sections 9 and 12 of the "Game Law Consolidation Ordinance, 1906," in so far as they relate to wildebeeste in the Bulalima-Mangwe, Gwanda, Chibi and Nyamandhlovu districts. |
| | AFRICAN COAST FEVER. |
| | Melsetter Native District. |
| 25.10.29. | Government Notice No. 645 cancels Government Notice No. 441 of 1929 and releases the farms Clearwater, Vleiplaats, Schäaplaats and Ratelshoek from quarantine. |
| 1.11.29. | Government Notice No. 161 of 1907 has been cancelled, and all hunting, shooting or firing grass within the area described below, on the southern side of the Zambesi River, is strictly prohibited :—An area having a breadth of two miles from any point along the Southern Rhodesia bank of the Zambesi River, and starting at the point on the Zambesi River five miles below the Victoria Falls where the line joining the beacons M 43 and M 44 intersects the boundary between Northern and Southern Rhodesia, and following along the territorial boundary line upstream in a westerly direction to a point fifteen miles above the Victoria Falls. |

# Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only. Outside Southern Rhodesia, 3d. per copy.

## AGRICULTURE AND CROPS.

No. 174. Notes on Hop Growing, by H. G. Mundy, F.L.S.
No. 218. Useful Measurements for Maize, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 362. The Cultivation of Rice, by H. G. Mundy, F.L.S.
No. 374. Fibre Crops, by J. A. T. Walters, B.A.
No. 403. Florida Beggar Weed, by H. G. Mundy, F.L.S.
No. 429. Propagation of Kudzu Vine, by H. C. Arnold.
No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.
No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.
No. 513. The Carob Bean in Rhodesia, by J. A. T. Walters, B.A.
No. 541. The Potato Crop under Irrigation, by G. R. Syfret.
No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.
No. 550. Onion Growing under Irrigation, by C. Mainwaring.
No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.
No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E., B.Sc., F.I.C.
No. 581. Leguminous Crops for Stock and Soil Improvement in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 590. Rye, by H. W. Hilliard, Junior Agriculturist.
No. 591. Maize Export Conference Proceedings.
No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.
No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.
No. 601. Maize for Export, by S. D. Timson.
No. 603. The Production of Maize in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 627. The Growing of Potatoes in Southern Rhodesia (Revised), by C. Mainwaring, Agriculturist.
No. 630. The Storage of Seed Potatoes, by H. C. Arnold.
No. 634. Barley, by P. V. Samuels.
No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.
No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.
No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agriculturist.
No. 656. Tractor Notes, by A. W. V. Crawley, M.E., F.G.S.
No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.
No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.
No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.
No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.

No. 684. Warning to Maize Growers: Maize for Export.
No. 685. Notes on Farm Practices at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.
No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.
No. 697. Results of Analysis of Samples taken under the "Fertilisers, Farm Foods, Seeds and Pest Remedies Orrdinance" during the year 1927-28.
No. 700. 'Further Notes on Farm Practice at the Government Farm, Gwebi, by S. D. Timson, M.C., Dip.Agric.
No. 704. The Importance of Research on Pasture Improvement in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.
No. 705. Suggested Cropping Programmes for Farms on the Sand Veld, by D. E. McLoughlin, Assistant Agriculturist.
No. 706. A Farmers' Calendar of Crop Sowings, by C. Mainwaring, Agriculturist.
No. 708. Witch Weed or Rooibloem (Striga Lutea)—a Serious Menace to Maize, by J. A. T. Walters, B.A., F.R.S.A., Agriculturist.
No. 709. Sand Veld Farming and its Possibilities, by E. D. Alvord, M.Sc. (Agr.).
No. 710. Monthly Reminders for the Farming Year, by the Division of the Chief Agriculturist.
No. 713. Ensilage, by J. A. T. Walters, B.A., Agriculturist.
No. 724. Ploughing by Tractor, by A. W. V. Crawley, M.E., F.G.S.
No. 727. Farmyard Manure, by A. P. Taylor, M.A., B.Sc., Agricultural Chemist.
No. 743. Sunn Hemp, by S. D. Timson, M.C., Dip.Agric.
No. 750. Cotton in Southern Rhodesia—Hints to Growers, by G. S. Cameron, Empire Cotton Growing Corporation.
No. 751. The Sweet Potato, by S. D. Timson, M.C., Dip.Agric. (Wye).
No. 757. Maize on the Sand Veld: Results at the Tobacco Experiment Station, Salisbury, by C. A. Kelsey-Harvey, Manager.
No. 759. Witch Weed (Striga Lutea): Methods of Control, by S. D Timson, M.C., Dip.Agric. (Wye).
Botanical Specimens for Identification.
Maize Grading Regulations.
Accelerating the Sprouting of Potatoes.

## REPORTS ON CROP EXPERIMENTS.

No. 94. Second Report on Experiments, by J. H. Hampton.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 341. Report on Crop Experiments, 1918-19, Gwebi Experiment Farm.
No. 342. Rotation Experiments, 1913-19, by H. G. Mundy, F.L.S., and J. A. T. Walters, B.A.
'o. 382. Annual Report of Experiments, Experiment Station, Salisbury, 1919-20.
No. 405. Annual Report of Crop Experiments, 1920-21, Gwebi Experiment Farm, by H. G. Mundy, F.L.S., and J. H. Hampton.
No. 411. Annual Report of Experiments, 1920-21, Experiment Station, Salisbury, by H. G. Mundy. F.L.S.

No. 413. Arlington Sand Veld Experiment Station, First Report, by H. G. Mundy, F.L.S., and E. E. Wright.
No. 432. Bulawayo Municipal Experiment Station, First Report, by H. G. Mundy, F.L.S.
No. 433. Winter Cereal Experiments, 1921, by D. E. McLoughlin.
No. 437. Annual Report of Crop Experiments, Gwebi Experiment Farm, 1921-22, by H. G. Mundy, F.L.S.
No. 440. Annual Report of Experiments, 1921-22, Experiment Station, Salisbury, by H. G. Mundy, F.L.S.
No. 485. Annual Report of Experiments, 1922-23, Agricultural Experiment Station, Salisbury, by J. A. T. Walters, B.A.
No. 486. Bulawayo Experiment Station, Annual Report for Season 1922-23, by H G. Mundy, F.L.S.
No. 514. Bulawayo Experiment Station Report, 1923-24, by H. G. Mundy, F.L.S.
No. 519. Annual Report of Experiments, 1923-24, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 537. Crop Rotations on the Gwebi Experiment Farm, 1923-24, by H. G. Mundy, Dip.Agric., F.L.S.
No. 564. A Maize Rotation Experiment, by A. R. Morkel.
No. 566. Bulawayo Experiment Station, Annual Report for Year 1924 25, by H. G. Mundy, Dip.Agric., F.L.S.
No. 608. Annual Report of Experiments, 1924-25, Agricultural Experiment Station, Salisbury, by H. G. Mundy, Dip.Agric., F.L.S.
No. 631. Bulawayo Experiment Station: Annual Report for Year 1925-26, by H. W. Hilliard.
No. 649. Annual Report of Experiments, 1925-26, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Manager.
No. 675. Bulawayo Experiment Station—Annual Report for Year 1926-27, by D. E. McLoughlin.
No. 683. Annual Report of Experiments, 1926-27, Agricultural Experiment Station, Salisbury, by H. C. Arnold, Station Manager.
No. 688. Report, 1923-24—1926-27, Gwelo Municipal Demonstration Stations, by D. E. McLoughlin.
No. 716. Report, 1927-28, Gwelo Municipality Demonstration Stations, by S. D. Timson, M.C., Dip.Agric.
No. 745. Salisbury Agricultural Experiment Station Annual Report, 1927-28, by H. C. Arnold.

## TOBACCO.

No. 605. Flue-Curing Tobacco Barns, Bulking and Grading Sheds, by P. H. Haviland, B.Sc. (Eng.), Acting Government Irrigation Engineer.
No. 607. Tobacco Seed Beds, by D. D. Brown.
No. 615. The Culture of Virginia Tobacco in Southern Rhodesia—Field Management, by D. D. Brown.
No. 617. Dark Fire-Cured Tobacco, by E. M. Matthews, B.Sc., Tobacco Adviser. Fire-Curing Tobacco Barn, by the Tobacco Advisers.
No. 629. Notes on Flue Curing of Tobacco, by C. A. Kelsey Harvey.
No. 641. The Handling, Grading and Baling of Cured Virginia Tobacco, by D. D. Brown.
No. 644. Tobacco Baling Boxes, by B. G. Gundry, Irrigation Branch.
No. 653. The Care of Tobacco Seed Beds, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A. (Trinidad).
No. 661. Flue-Curing Tobacco Barns, 12 ft. x 12 ft. x 16 ft., by B. G. Gundry.
No. 665. Tobacco Pests of Rhodesia, by Rupert W. Jack, F.E.S., Chief Entomologist.
No. 671. Wildfire and Angular Spot of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.
No. 676. Mosaic Disease of Tobacco, by J. C. F. Hopkins, B.Sc., A.I.C.T.A.

No. 679. Tobacco Culture in Southern Rhodesia: The Harvesting and Curing of Virginia Tobacco, by D. D. Brown.
No. 689. The Lesser Tobacco Wireworms, by Rupert W. Jack, F.E.S.
No. 690. Thermal Efficiency of Tobacco Barns and Furnaces, by C. L. Robertson, B.A., B.Sc., A.M.I.C.E.
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No. 715. Turkish Tobacco Culture in Southern Rhodesia, by D. D. Brown, Chief Tobacco Expert.
No. 718. Preliminary Experiments on the Control of White Mould of Tobacco, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.
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No. 753. Leaf Spotting of Tobacco caused by Mosaic, by J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A., Chief Botanist and Mycologist.

STATISTICS.

No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 224. Statistical Returns of Crops in Southern Rhodesia for the Season 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 247. Statistical Returns of Crops Grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and Fred Eyles, F.L.S.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
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No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
No. 361. Statistics of Live Stock and Animal Produce for the Year 1919, by F. Eyles, F.L.S.
No. 380. Statistics of Crops Grown by Europeans in Southern Rhodesia, 1919-20, by H. C. K. Fynn.
No. 393. Statistics of Live Stock and Animal Produce for 1920, by H. C. K. Fynn.
No. 409. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1920-21, by H. C. K. Fynn.
No. 426. Statistics of Live Stock and Animal Products for the Year 1921, by H. C. K. Fynn.
No. 443. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1921-22, by F. Eyles, F.L.S., and H. C. K. Fynn.
No. 459. Statistics of Live Stock and Animal Products for the Year 1922, by A. Borradaile Bell.
No. 484. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1922-23, by A. Borradaile Bell.
No. 502. Winter Crops, 1923, by A. Borradaile Bell.
No. 527. Statistics of Crops Grown by Europeans in Southern Rhodesia for the Season 1923-24, by A. Borradaile Bell.
No. 543. Statistics of Live Stock and Animal Products for the Year 1924, by A. Borradaile Bell.

No. 580. Statistics of Summer Crops Grown by Europeans in Southern Rhodesia for the Season 1924-25, by A. Borradaile Bell, Statistician.

No. 595. Statistics of Live Stock and Animal Products for the Year 1925, by A. Borradaile Bell, Statistician.

No. 626. Statistics of Summer Crops grown by Europeans in Southern Rhodesia for the Season 1925-26, by A. Borradaile Bell, Statistician.

No. 646. Statistics of Live Stock and Animal Products for the Year 1926. by A. Borradaile Bell, Statistician.

No. 682. Agricultural Returns for 1926-7 : Preliminary Returns, by Thomas G. Gibson, Government Statistician.

## LIVE STOCK.

No. 227. An Experiment in Beef Production, by R. C. Simmons.

No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.

No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.

No. 336. Butchering and Flaying.

No. 338. From Breeder to Butcher; Beef Feeding Experiment No. 5, by E. A. Nobbs, Ph.D., B.Sc.

No. 381. From Breeder to Butcher; Cattle Feeding Experiment No. 8, by Eric A. Nobbs, Ph.D., B.Sc.

No. 421. From Breeder to Butcher; Cattle Feeding Experiment No. 9, Government Experiment Farm, Gwebi, by E. A. Nobbs, Ph.D., B.Sc., F.H.A.S.

No. 446. From Breeder to Butcher; Cattle Feeding Experiment No. 11, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc., F.H.A.S.

No. 468. From Breeder to Butcher; Cattle Feeding Experiment No. 13, by Eric A. Nobbs, Ph.D., B.Sc.

No. 483. From Breeder to Butcher; Cattle Feeding Experiments Nos. 14 and 15, Government Experiment Farm, Gwebi, by Eric A. Nobbs, Ph.D., B.Sc.

No. 584. Merino Sheep in Southern Rhodesia, by H. W. Hilliard.

No. 624. The Construction of Dipping Tanks for Cattle (Revised).

No. 698. The Rearing of Bacon Pigs for Bacon Factory Purposes, by T. Hamilton, M.A., N.D.A., N.D.D.

No. 701. Feeding Bullocks at Gwebi, by S. D. Timson, M.C., Dip.Agric.

No. 719. Hand-Rearing of Calves (Revised), by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

No. 720. Fattening for Beef at the Gwebi Farm, by H. G. Mundy, Chief Agriculturist, and T. J. Needham, Accountant, Agricultural and Veterinary Departments.

No. 737. Fur and Wool-Producing Rabbits, by Captain Edgar S. Everett Hovere Farm, Banket.

No. 749. Dehorn your Commercial Cattle, by W. Fleming, Stock Adviser.

No. 755. Iodine in Animal Nutrition, by J. Park Hamilton, District Veterinary Surgeon, Gwelo.

Arsenite Cattle Dip—How to Mix.

## DAIRYING.

No. 520. Treatment of Gassy Curds in Cheese-making, by T. Hamilton, M.A., N.D.A., N.D.D.

No. 530. The Dairy Industry: Causes of Variation in Cream Tests, by T. Hamilton, M.A., N.D.A., N.D.D.

No. 562. Bacteria and the Dairy Industry, by J. R. Corry, B.Sc. (Agr.).

No. 567. Cottage Cheese, by J. R. Corry, B.Sc. (Agr.).

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No. 577. Cream Cheese, by J. R. Corry, B.Sc. (Agr.).

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No. 594. Milk Recording and its Advantages, by T. Hamilton, M.A., N.D.A., N.D.D. Introduction by J. R. Corry, B.Sc.

No. 604. Farm Butter Making, by T. Hamilton, M.A., N.D.D., N.D.A., Dairy Expert.
No. 606. The Production of Clean Milk, by T. Hamilton and J. R. Corry, Dairy Experts.
No. 667. Farm Cheese-making, by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.
No. 703. Dairy Buildings in Southern Rhodesia: Cow Byre—Type II., by B. G. Gundry, Irrigation Branch.
No. 711. Dairy Buildings in Southern Rhodesia. A Small Farm Dairy, by B. G. Gundry, A.I.Mech.E.
No. 717. Gouda or Sweet Milk Cheese-Making, by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.
No. 730. Common Defects in Butter-making, by T. Hamilton, M.A., N.D.A., N.D.D., and J. R. Corry, B.Sc. (Agr.), Dairy Experts.
No. 752. Cheese as an Article of Diet, by T. Hamilton, M.A., N.D.A., N.D.D., Dairy Expert.

## VETERINARY.

No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.
No. 474. Heartwater.
No. 536. Inoculation of Cattle against Redwater and Gall Sickness, by Ll. E. W. Bevan, M.R.C.V.S.
No. 570. The Spaying of Bovines, by G. C. Hooper Sharpe, M.C., M.R.C.V.S., and M. H. Kingcome, M.R.C.V.S.
No. 597. Suspected Poisoning of Stock: The Proper Procedure, by M. H. Kingcome, M.R.C.V.S. (Lon.), and A. W. Facer, B.A (Oxon.), A.I.C.
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